October 1964

culture

SELECTED CONTENTS

Your Holding and its Records . . . . . *W. J. Wright*
Turkeys—The present economic trends . . . *W. Dyfri Jones*
Rearing Heifer Calves on Contract . . . . . *A. Adamson*
The Build-up of Potato Yields . . . . *Professor J. B. Ivins*
Pig Housing (1) . . . . . *W. A. R. Harris*
Pioneers of Modern British Farming: Arthur S. Cray D. J. Columbus Jones
Stilton—King of cheese . . . . . *Ruth Dawson*
Intensive Beef from Shorthorns . . *G. H. Beard and A. Lester-Card*

Published for the Ministry of Agriculture, Fisheries and Food by Her Majesty's Stationery Office

More time at market – while automatic machinery does the feeding.

This man is feeding his entire pig herd
RIGHT NOW!

AUTOMATIC electric machinery, in fact, does the entire job for him. He merely sets the time-switch and goes away to do other jobs. It saves a lot of time and labour—in some cases up to 90% on traditional methods.

Find out more, now, from your Electricity Board, Electrical Contractor or Agricultural Machinery Dealer. Or fill in the coupon.

Electricity cuts production costs

To: Electrical Development Association (A/AM), 2 Savoy Hill, London, WC2.
Please send me free copies of the leaflets
'Automatic Feed Preparation by Electricity'
and 'Automatic Feeding by Electricity'.

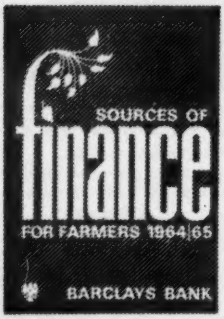
NAME .....

ADDRESS .....

.....

.....

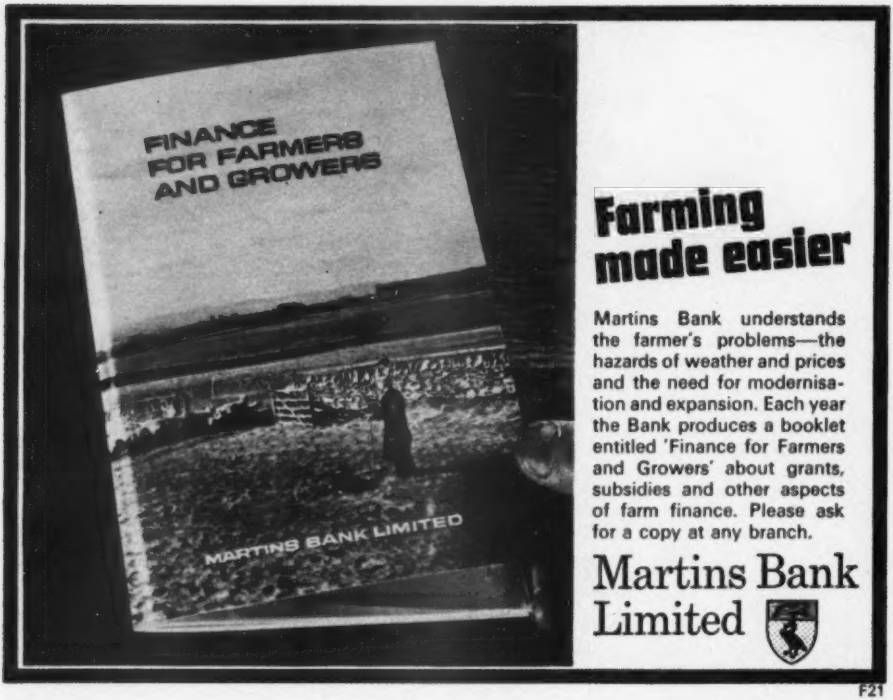
SOURCES OF finance FOR FARMERS 1964|65



is the new edition of the Barclays guide to the grants and loans available to the farmer. Written in consultation with the Ministry of Agriculture, it is of proven value to farmers and others interested in agricultural finance. Copies, which are of course free of charge, may be obtained from any branch of the Bank.

BARCLAYS BANK

Money is our business



Farming made easier

Martins Bank understands the farmer's problems—the hazards of weather and prices and the need for modernisation and expansion. Each year the Bank produces a booklet entitled 'Finance for Farmers and Growers' about grants, subsidies and other aspects of farm finance. Please ask for a copy at any branch.

Martins Bank Limited

F21

WRIGHT farm buildings

OUTSTANDING IN DESIGN

COMPETITIVELY PRICED

FULLY GUARANTEED FOR FIVE YEARS

Available in clear spans of 45, 50, 55, 60, 65, 70, 75 and 80 feet at prices from 6/- to 7/4d per square foot, delivered and erected. Buildings also available in 21, 25, 30 and 40 feet spans from 5/10d per square foot. Our fully illustrated catalogue is free on request.

Tick whichever is required

COMPLETE THIS COUPON NOW!

☐ Please send your new catalogue (without obligation).
☐ Please ask your representative to contact me for an appointment.
☐ The dimensions of the buildings in which I am interested are:—

State Length..... Width..... Height.....

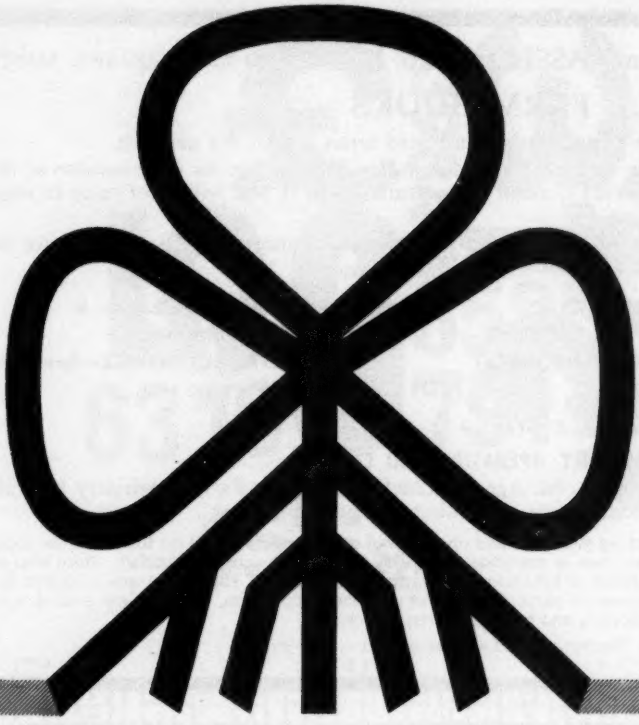
NAME.....

ADDRESS.....

.....

A. Tel. No.....

R. O. WRIGHT & CO. LTD LOWER WORKS BANBURY OXON Telephone Banbury 4271



BASIC SLAG
Advisory Service

Basic Slag Spreading Services

The fact that the modern farmer continues to use more and more basic slag is proof of his confidence in its value. But part of the credit for the threefold increase in consumption must go to the growing number of merchants and contractors who now provide spreading services. They see to the delivery and spreading of well over half a million tons per annum—mostly from bagged supply stored ready on the farm. And over 200,000 tons per annum are delivered and spread from bulk supply, direct from works or privately owned bulk stores. These spreading services are available at modest charges to relieve the farm staff of one more heavy task. They make it possible to apply the usual dressings of basic slag at the most opportune time.

A GOOD SPREADING SERVICE SAVES YOU TIME AND MONEY

If you want to know of the nearest basic slag spreading contractor or merchant drop a line to:-
BASIC SLAG ADVISORY SERVICE (Albert & Bilston brands), HARVEST HOUSE, IPSWICH, SUFFOLK
Telephone: Ipswich 56721

New from CASSELL & Co. Ltd. 35 RED LION SQUARE, LONDON, WC.1.

CASSELL FARM BOOKS

- An already popular, well illustrated series at only **5/-** net each.
- Suitable for rural studies in Secondary Schools and for examinations at the level of the City and Guilds General Agriculture (Stage I), and will be of value to anyone starting in farm work.
- Edited by Graham Boatfield, Agricultural Education Organiser for East Suffolk.
- Each approx. 80 pp. with 18 line illustrations.

1. FARM CROPS
2. FARM LIVESTOCK
3. FARM MACHINERY
4. FARM CROP SCIENCE—Nov. 9
5. FARM TRACTORS—Nov. 9
6. FARM LIVESTOCK SCIENCE—Spring 1965
7. FARM CALCULATIONS—Spring 1965

ALSO AVAILABLE NOV. 9

FARM MACHINERY OPERATION AND CARE

by J. C. Turner, A. M. Agr. E., Chief Examiner in Farm Machinery Operation and Care for the City and Guilds of London Institute

Covers the working principles and operation of all equipment found on British farms today. For students studying on their own or attending day-release or full-time courses, especially those who are preparing for the C and G, Union or Educational Institutes, and Union of Lancashire and Cheshire Institutes examinations. The sections on particular types of machinery, operation, control, fault-finding, etc., will also be of great value to farmers and farm machinery operators.

192 pp., 47 line illustrations and 49 photographs — 21/- net

HILL offer:

EXTRA DURABILITY: steel framework guaranteed for 30 years.
EXTRA STRENGTH: steel frames provide for longer bays and wider buildings.
EXTRA RESILIENCE: steel frames are not affected by sudden changes in temperature.
EXTRA SERVICE: fully comprehensive plans and specifications free of charge to Ministry standards.

POST THIS COUPON FOR FREE BROCHURE

HILL

To: HILL CONSTRUCTION CO. (ENGINEERS) LTD., WIDE LANE, SWAYTHLING, SOUTHAMPTON

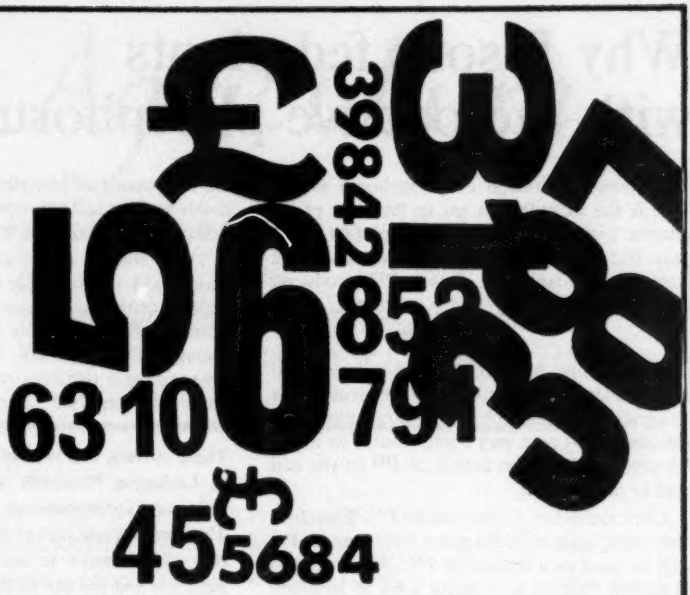
Please send FREE details and Brochure.

NAME.....

ADDRESS.....

Size of building required Telephone.....

Span.....Length.....Height to Eaves.....



Figures aren't everything

When you talk farm finance with the manager of a Westminster Bank country branch, he won't stop short at the figures. He'll understand what is behind them, see your ideas as *you* see them, in terms of a practical farming problem. He can do this because, although a banker by profession, he is a countryman at heart, able to see with an understanding eye the possibilities—and problems—of the land by which his customers live. That is one reason why more and more farmers, growers and nurserymen today prefer to . . .

Bank with the **Westminster**

Westminster Bank Limited, Head Office: 41 Lothbury, London, E.C.2

Why Fisons fed plants with radioactive phosphorus

The common isotope of phosphorus is P^{31} This is the isotope you get in fertilizer phosphorus. Fisons handle thousands of tons of it a year. But there is also a man-made radioactive isotope of phosphorus. This is P^{32}, produced when you bombard P^{31} with neutrons:

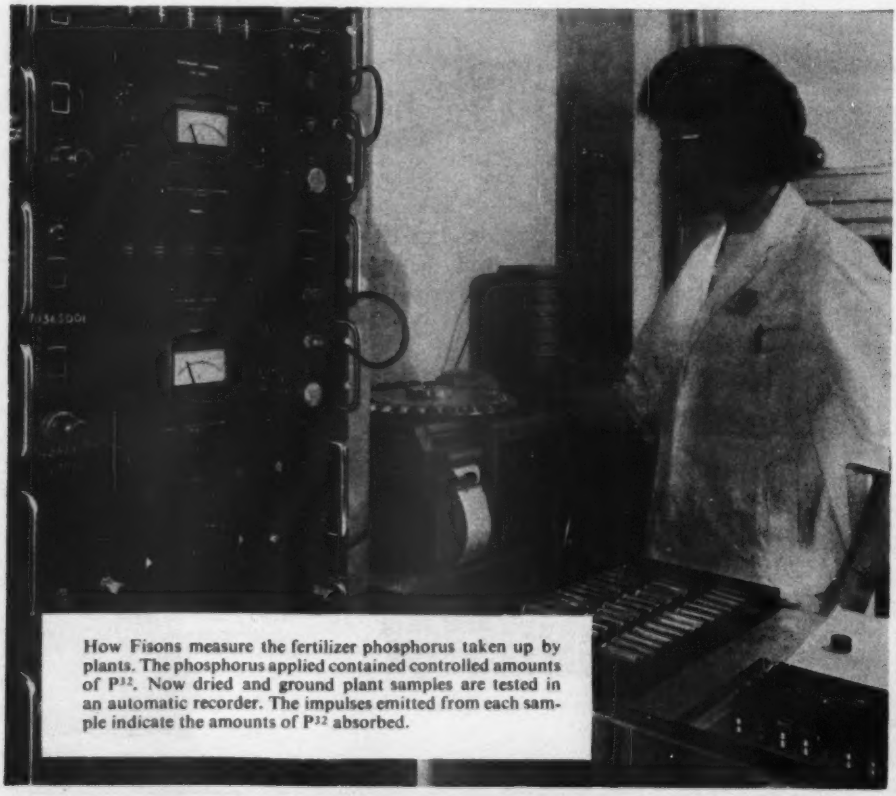
$$P^{31} + n \longrightarrow P^{32}$$

This isotope is, of course, never present in any fertilizer made available to the farmer. But in agricultural research, under controlled conditions, it can be a very useful tool. For it can be used to check the action of P^{31} in the soil and in plant tissue.

Chemically P^{32} is identical to P^{31}. Therefore they both behave in the same way. And so P^{32} can be used as a tracer for P^{31}. At Levington Research Station it is being used to measure the movement of phosphorus between the soil solids and the soil solution, and to calculate the reserves of available phosphate in the soil solids.

These studies are vital if we are to understand plant nutrition. For the soil solution holds little phosphorus. The supply must be replenished several times a day if the plants are to get enough of this element. The size of the available reserve is also important—before and after fertilizer is applied. This knowledge directly affects our control of crop production.

These studies, and related work, are being done at Levington Research Station on samples of soil from experimental sites all over the country. They are just one part of the important contribution Fisons make to our knowledge of plant nutrition and the use of fertilizers.



How Fisons measure the fertilizer phosphorus taken up by plants. The phosphorus applied contained controlled amounts of P^{32}. Now dried and ground plant samples are tested in an automatic recorder. The impulses emitted from each sample indicate the amounts of P^{32} absorbed.

Agriculture

VOLUME 71 · NUMBER 10 · OCTOBER 1964

Editorial Offices
Ministry of Agriculture, Fisheries and Food
Whitehall Place, London S.W.1. Trafalgar 7711

CONTENTS

Milk and the profit margin 445
Your Holding and its Records *W. J. Wright* 446
Turkeys—The present economic trends *W. Dyfri Jones* 449
Rearing Heifer Calves on Contract *A. Adamson* 454
The Build-up of Potato Yields *Professor J. D. Ivins* 457
Pig Housing (1) *W. A. R. Harris* 460
Pioneers of Modern Farming: Arthur Cray *D. J. Columbus Jones* 463
Research at Rothamsted *Sylvia Laverton* 468
Stilton—King of cheese *Ruth Dawson* 470
Intensive Beef from Shorthorns *G. H. Beard* and *A. Lester-Card* . 474
Machinerywise: Sugar Beet Harvesters
F. L. Gammon and *C. M. Poole* 479
Farming Cameo Series 3 : 21. Petersfield, Hants *John H. Hamilton* 481
From the ALS: Concreting in Cold Weather *F. W. Holder* . . 483
In Brief 485
Book Reviews 488
Agricultural Chemicals Approval Scheme 492

Provided that the source is acknowledged in each instance such articles and notes as are published in this Journal without any specific reservation regarding copyright may be reproduced in any registered newspaper or public periodical without special permission. The Ministry does not accept responsibility for statements made, or views expressed, in signed contributions to this Journal or in those reproduced from another source.

Further, the Ministry does not accept responsibility for any of the private and trade advertisements included in this publication.

In the interests of factual reporting, occasional reference in this Journal to trade names and proprietary products may be inevitable. No endorsement of named products is intended, nor is any criticism implied of similar products which are not mentioned.

All communications respecting advertising in the Journal should be addressed to the Advertisement Contractors, Cowlishaw and Lawrence (Advertising) Ltd., Memorial Hall Buildings, 16 Farringdon Street, London E.C.4. Telephone: City 3718.

ICI'S MOST FAMOUS COMPOUND NOW MORE CONCENTRATED!

See how much ICI New No. 1 has to offer you. It keeps the well-proved 1:1:1½ plant food ratio. But its higher concentration saves 20% space, cuts handling costs by just as much and makes New No. 1 far quicker to work with. It is clean to handle, has good granulation and flows freely. Packed in polythene for outside storage too. And you can get ICI New No. 1 now—on this month's early delivery rebate. Order from your merchant today.

ICI **MODERN FARMERS RELY ON ICI— AND PROFIT BY EXPERIENCE!**

MILK

and the profit margin

SOME dairy farmers soliloquizing, like Hamlet, on the slings and arrows of outrageous fortune, may be inclined to see only the natural hazards of their farming operations and overlook those important factors leading to a high profit margin which they really could do something about; for example, level of yield, feeding system, density of stocking, housing and the best possible use of labour.

High yields are not necessarily the most profitable, but if soundly achieved they are more likely than low yields to leave a margin.

Attempts are sometimes made to classify feeding systems as high yield, bulk feed or traditional. High yields from cows with a high potential are obtainable on adequate supplies of good quality food, whether the greater part of that food supply is made up of high quality forage crops and grass or contains a relatively high proportion of concentrates. Where the intensity of stocking demands a high level of concentrate feeding, the objective must be to avoid any waste of this relatively expensive source of feed by sound rationing.

Grass itself is easily wasted if the rate of stocking does not fully match up to its output. Matching up the two calls for high level management. The better this level of management, the greater the rate of stocking and consequently the higher the margin per acre.

If you are going to the Royal Dairy Show at Olympia (October 27–30), may we suggest that time will be well spent at the Ministry's exhibit on this subject.

THE RIGHT CROPS • THE RIGHT PROFIT

THE RIGHT PLANS

Your Holding and its Records

W. J. Wright

AT first glance the prospect of applying recognized management techniques to horticultural businesses appears to be fraught with difficulties. In a given area there is often less uniformity of cropping than in agriculture, the value of the crops may often justify irrigation and glass protection. A wide range of crops, and combinations of them, become possible, so that the complexities of the business quickly increase. So also do the difficulties of collecting information for comparative purposes from holdings of a broadly similar type. Also there are people, both inside and outside the industry, who believe that price fluctuations are such that it is impossible to indulge in forward budgeting with any chance of success.

Let it be said at once that there can be big fluctuations in market price from year to year. Yet generally there are yield variations which tend to counteract this—over-supply means low prices and vice versa, and the returns per acre over a five- or ten-year period are reasonably steady. Even so, a budget can be wide of the mark in individual years.

It's got to come

Over a period some crops show a higher output per acre than others; so on some types of holdings by spreading the risk—and incidentally the peaks of labour demand for planting and harvesting—and growing generally high output crops, the out-turn is usually quite good on a 'swings and roundabouts' principle. But this doesn't mean that the less efficient grower is going to find conditions easier in the future, or that the man on unsuitable soil in a bad situation without water available or lacking other natural advantages is going to find his holding more profitable. He isn't! In the future, the grower will need to be just as competent, yet find time to keep more records and for giving thought to management. Not 'what to do and how' but rather 'which to do for a good margin of profit'.

When the grower has to do most of the work on the holding himself he is generally too busy to worry much about keeping records. He just waits for the accountant to produce his annual tax statement and is generally satisfied if this shows a reasonable profit. During the year the grower watches progress by bank statements and receipts from the market. Plans for the future may be decided partly by circumstances—availability of land, extent of perennial crops—and partly by his impressions of the profitability of past cropping. To some extent this approach works, but how much better if more time were devoted to record-keeping so that at the end of the year a better assessment could be made of the year's performance, any faults uncovered and the information used as a sounder basis for future planning.

Profit and Loss Account a starting point

Any records are of some value, and if in doubt advice should be sought as to those which would be of greatest help on a particular holding. The Profit and Loss Account generally gives a good breakdown of COSTS into Labour, Fertilizer, Seeds and so on, but SALES are often given as one figure, and a simple split into Vegetables, Fruit and so on is a good start to keeping more useful accounts.

From even such simple beginnings quite a lot can be learned. To start with, is the Output high enough to provide the equivalent of the minimum rate for an agricultural worker? Total sales under £1,500 means hardship, unless there are special circumstances. Even if the output is higher than this, the Net Farm Income (what is left after all charges, except the wages of the grower and his wife, have been met) may provide only the minimum wage for the grower himself and leave nothing over as the reward for his management of the business or the capital invested in it (Management and Investment Income).

Often, then, the first stage in replanning a holding is to try to increase the output. If it has been possible to keep separate sales figures for the various broad groups of crops, then a start can be made in selecting those which appear to be grown successfully, with a view to increasing them. For example, if the gross output from outdoor vegetables or soft fruit is in the range £250–300 per acre, from top fruit £250–400 per acre, and from glasshouse crops upwards of £100 per 1,000 sq. ft, then probably all these departments are functioning fairly satisfactorily. If the overall figures are much below this, then the emphasis should either be placed elsewhere or attention paid to improving the growing technique to increase the level of output to nearer average levels.

Then the costs side. These should not amount to more than about 80 per cent of the gross output, otherwise the difference is likely to be too small to give an adequate livelihood. The grower interested in finding out more about his business may well be prepared to keep more detailed records, especially if he can see them being of direct use. One suggestion would be to keep separate returns for each crop. If, say, he finds out that the return from runner beans falls below £300–450 per acre *consistently over a three year period*, then he should seriously consider whether to continue growing the crop because this performance is well below that of other growers. Of course, there are obvious weaknesses in this broad 'first look' at the holding, but limited records may prevent anything more being achieved to start with.

THE RIGHT CROPS ● THE RIGHT PROFIT

THE RIGHT PLANS

Your Holding and its Records

W. J. Wright

AT first glance the prospect of applying recognized management techniques to horticultural businesses appears to be fraught with difficulties. In a given area there is often less uniformity of cropping than in agriculture, the value of the crops may often justify irrigation and glass protection. A wide range of crops, and combinations of them, become possible, so that the complexities of the business quickly increase. So also do the difficulties of collecting information for comparative purposes from holdings of a broadly similar type. Also there are people, both inside and outside the industry, who believe that price fluctuations are such that it is impossible to indulge in forward budgeting with any chance of success.

Let it be said at once that there can be big fluctuations in market price from year to year. Yet generally there are yield variations which tend to counteract this—over-supply means low prices and vice versa, and the returns per acre over a five- or ten-year period are reasonably steady. Even so, a budget can be wide of the mark in individual years.

It's got to come

Over a period some crops show a higher output per acre than others; so on some types of holdings by spreading the risk—and incidentally the peaks of labour demand for planting and harvesting—and growing generally high output crops, the out-turn is usually quite good on a 'swings and roundabouts' principle. But this doesn't mean that the less efficient grower is going to find conditions easier in the future, or that the man on unsuitable soil in a bad situation without water available or lacking other natural advantages is going to find his holding more profitable. He isn't! In the future, the grower will need to be just as competent, yet find time to keep more records and for giving thought to management. Not 'what to do and how' but rather 'which to do for a good margin of profit'.

When the grower has to do most of the work on the holding himself he is generally too busy to worry much about keeping records. He just waits for the accountant to produce his annual tax statement and is generally satisfied if this shows a reasonable profit. During the year the grower watches progress by bank statements and receipts from the market. Plans for the future may be decided partly by circumstances—availability of land, extent of perennial crops—and partly by his impressions of the profitability of past cropping. To some extent this approach works, but how much better if more time were devoted to record-keeping so that at the end of the year a better assessment could be made of the year's performance, any faults uncovered and the information used as a sounder basis for future planning.

Profit and Loss Account a starting point

Any records are of some value, and if in doubt advice should be sought as to those which would be of greatest help on a particular holding. The Profit and Loss Account generally gives a good breakdown of COSTS into Labour, Fertilizer, Seeds and so on, but SALES are often given as one figure, and a simple split into Vegetables, Fruit and so on is a good start to keeping more useful accounts.

From even such simple beginnings quite a lot can be learned. To start with, is the Output high enough to provide the equivalent of the minimum rate for an agricultural worker? Total sales under £1,500 means hardship, unless there are special circumstances. Even if the output is higher than this, the Net Farm Income (what is left after all charges, except the wages of the grower and his wife, have been met) may provide only the minimum wage for the grower himself and leave nothing over as the reward for his management of the business or the capital invested in it (Management and Investment Income).

Often, then, the first stage in replanning a holding is to try to increase the output. If it has been possible to keep separate sales figures for the various broad groups of crops, then a start can be made in selecting those which appear to be grown successfully, with a view to increasing them. For example, if the gross output from outdoor vegetables or soft fruit is in the range £250–300 per acre, from top fruit £250–400 per acre, and from glasshouse crops upwards of £100 per 1,000 sq. ft, then probably all these departments are functioning fairly satisfactorily. If the overall figures are much below this, then the emphasis should either be placed elsewhere or attention paid to improving the growing technique to increase the level of output to nearer average levels.

Then the costs side. These should not amount to more than about 80 per cent of the gross output, otherwise the difference is likely to be too small to give an adequate livelihood. The grower interested in finding out more about his business may well be prepared to keep more detailed records, especially if he can see them being of direct use. One suggestion would be to keep separate returns for each crop. If, say, he finds out that the return from runner beans falls below £300–450 per acre *consistently over a three year period*, then he should seriously consider whether to continue growing the crop because this performance is well below that of other growers. Of course, there are obvious weaknesses in this broad 'first look' at the holding, but limited records may prevent anything more being achieved to start with.

Preparing a forward budget

If more detailed information is available about individual crop outputs, it can be used as a better basis for drawing up a forward budget. In a sense the grower is building up his own standards of performance, so that he knows which crops have the highest output under his conditions. Bearing in mind the need for spreading the risk, for evening out the demand for labour during the season and for not over-supplying local outlets, it is possible to work out a forward budget comprising the high output crops. Provided the costs can be kept down to about 80 per cent of the anticipated gross output, a start has been made. Even in the absence of any data for the holding in question, some form of plan can be worked out using typical local gross output figures, although this is obviously more likely to be wide of the mark than if the information comes from the holding itself.

A forward budget based on crop margins

If more information than this is available, it may be possible to base the selection on Crop Margins. These are the differences between the gross outputs of the crops and the direct expenses, including labour, incurred in growing them. This is a new term which seems to be more appropriate to horticulture than 'Gross Margin', which as defined for agricultural purposes ignores regular labour employed on crop production and treats casual labour as a variable cost, i.e., avoidable if a particular crop is not grown. By comparing Crop Margins, one can decide which crops are making the highest contribution to the profits from the business, and by combining these crops the best plan is likely to emerge.

Of course, the fixed costs which are going on all the time must also be deducted before the Management and Investment income can be worked out. Here again, in the absence of any data from the holding, budgets may be wide of the mark, but estimates of Crop Margins can be obtained from N.A.A.S. Officers and can be used to supplement whatever information is available for the holding in question when replanning cropping.

If a grower is going to provide his own figures for Crop Margins, he will obviously need not only individual crop outputs but also the direct production costs for each crop—and that calls for fairly detailed record-keeping.

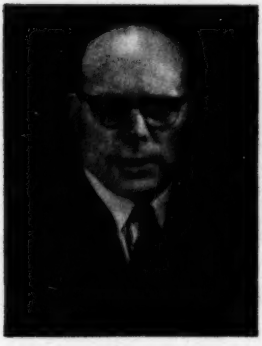
Help from the N.A.A.S.

For those growers who want to keep records which will be of help in improving the management of their businesses a record book especially designed for horticultural management purposes is being prepared by the N.A.A.S. A standard way of presenting accounts has also been produced, which, if filled in completely, supplies all the information necessary to calculate various standards of performance. Even the less detailed figures from an ordinary Profit and Loss Account presented in this way can be very useful in reaching conclusions about the management of the business.

The figures obtained can be compared with suitable local standards by the district N.A.A.S. officers. This helps to bring out any weaknesses in the business, and information about the holding is presented in such a way that it can be used to formulate an improved plan.

W. J. Wright, B.Sc.(Hort.), N.D.H.(Hons.), worked for several years as a District Horticultural Officer in Gloucestershire. He was recently transferred to the Headquarters of the N.A.A.S., in London, to help in the development of horticultural management.

W. Dyfri Jones



TURKEYS

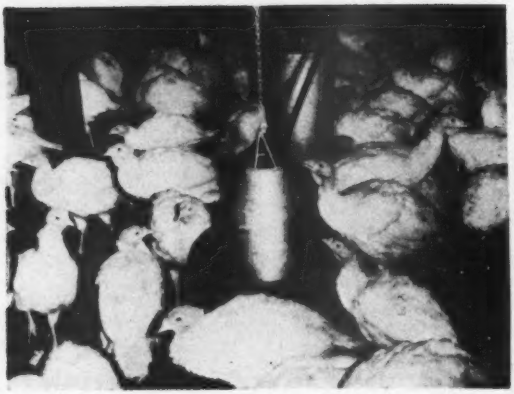
The present economic trends

The author is Research Lecturer in the Department of Agricultural Economics, University College of Wales, Aberystwyth

THE increasing real income enjoyed by the community means that more meat is being and will be eaten, both in total and as a proportion of food expenditure. Over the last ten years broilers have played a very prominent part in securing for poultry an increasing share of this market for meat. The fantastic growth of the broiler industry during this period has rather masked the fact that the output of turkeys has, during the same time, risen more than three-fold—from about 7,000 tons in 1952-53 to about 25,000 tons in 1962-63. A further and more rapid expansion of the turkey industry is both desirable and possible; but it appears that, if it is to capture its rightful share of the meat market, it must reorganize itself along lines which will ensure the most efficient production, processing, and marketing.

Two-thirds in large flocks

Most of the turkeys in this country seem to be contained in a few very large flocks. Small-scale producers (those with under 500 birds), although very much in the majority, probably rear less than one-third of the total number hatched each year. According to the June, 1962, Agricultural Census, only 5·5 per cent of the 9,226 rearing (as distinct from breeding) flocks on agricultural holdings in England and Wales were of 1,000 birds or more, yet these accounted for 77 per cent of the total head of young birds carried at that time.



Although the turkeys shown here, at 14–18 weeks old, are approaching the age at which it is most profitable to kill, they are probably heavier than the market requires for most of the year

As much as 48 per cent were contained in only 119 flocks, each of over 5,000 birds. More than half the flocks on agricultural holdings were of 25 birds or less, and three out of every four had fewer than 100.

A large proportion of the annual output of poults are, of course, hatched after 4th June and are probably distributed between about another 7,500 flocks of varying size, which cater for the Christmas market; but the distribution of the birds in September is likely to present a pattern of flock-size not greatly different from that found in June.

Food and poults together constitute about 86 per cent of the total costs of rearing turkeys. Obviously, future economies must be sought in the price and quality of these two items, although they are outside the rearer's direct control. But on the rearing side, apart possibly from the quality of management, the scale of operation appears to be the most important factor affecting costs per bird, notably those of labour, food and deadstock depreciation.

Economies of scale

A survey* conducted in 1961 showed that, among 96 flocks killed at different ages, the average labour requirements per 100 birds per day fell from about 0·55 hours for flocks of less than 100 turkeys to about 0·22 hours for flocks of about 600. This analysis showed that the heaviest reduction in labour requirements per 100 birds was achieved from increases in the size of flock up to about 500–600; thereafter, although additional economies were effected, they were very much less.

There were indications from the survey, probably as a result of the food wastage caused by inadequate storage facilities and inefficient feeding equipment, that the food consumption per bird was higher for the smallest than for the middle-sized and the largest flocks.

Large-scale rearing leads also to cost reductions through bulk purchase of foods and of poults, and in many cases it admits of the purchase of equipment for home milling and mixing, involving the use perhaps of home-grown cereals. It appears that to bring about any such savings in the cost of food a minimum annual output of 25 tons is necessary, enough to cater for 1,000

*'Some further thoughts on the economics of turkey production'. W. Dyfri Jones; *Turkeys*, (Journal of the British Turkey Federation), March, 1963.

birds to 22 weeks or 1,750 birds to 17 weeks. The saving on cost per ton then increases sharply to as much as 70 shillings for an output of 50 tons; thereafter it is still substantial, although less spectacular. On mixed farms it is the total number of all livestock carried, not only the turkeys, that determines whether or not the purchase of such equipment is justifiable; but a larger flock will always result in further economies in the cost of food.

Where similar buildings and equipment are used, the larger the flock the less is the deadstock depreciation per bird. In practice, however, many flocks, especially the smaller ones, are reared in converted farm buildings, and many share the use of these buildings and of equipment with other stock. Such practices result in lower depreciation charges, often lower even than those for larger flocks using specialist equipment.

Such economies in labour and food utilization and in depreciation charges can reduce the costs of rearing (to 16–22 weeks), for flocks of over 1,000 birds, by 5*s*. or 6*s*. per bird, compared with those of less than 500.

Similar economies of scale must operate on breeding farms too, and can help towards reducing the cost of the day-old poult; and processing plants will lessen their overheads per unit of throughput the larger their plant and the fuller the use made of their buildings, equipment and labour.

The demand side

In recent years, 80 per cent of the annual output of turkey has been consumed at Christmas, the remainder being eaten largely at Easter, Whitsun, and August Bank Holiday. Although more pre-packed oven-ready birds than fresh ones were sold last Christmas, it was revealed that consumers were prepared to pay at least 1*s*. per lb more for fresh than for frozen oven-ready birds at this season.

Very few fresh turkeys are sold during the rest of the year, trade consisting largely of the smaller, cheaper, oven-ready bird. Surveys carried out for the British Turkey Federation in recent years have revealed that, in the pre-packed (oven-ready) category, the medium-sized bird (8–13 lb) is by far the most popular at *Christmas* and that this size is increasing in popularity; the smaller bird also has shown a slight increase. In the 'fresh' category, the

These 18–22 weeks-old birds were reared on a farm in Kent with an eye to the Christmas market, when heavier turkeys are more in demand

medium weight, although still the most popular, has shown a slight decline in sales recently; so too has the smaller weight; whereas the larger bird has shown little change. The total number of non-packed birds has declined very slightly, whilst that of the pre-packed has increased.

To meet the demand for medium and small birds, producers generally are killing at a younger age: at 18–22 weeks when catering for the Christmas market and at 12–14 weeks during the rest of the year. Although, with intensive rearing, 17 or 18 weeks is the most profitable age to kill, birds of this age are heavier than the market requires them to be, except at Christmas. For most of the year the small bird of 6–7 lb, killed at 13–14 weeks, is most in demand. However, the profit, at about 2*s*. per bird, from killing at the younger age is much less than that from killing at 17–18 weeks, a fact which makes the production of small birds worth while only if it is practised on a fairly large scale.

Only about one-third of all households eat turkey at Christmas, and most of these are in the higher income category. Obviously there is plenty of scope for increasing sales to the lower income groups, but it can be done only by making the price of turkey more competitive with that of other meats, notably chicken. The way to do this is by reducing costs and profits in breeding, rearing, processing and retailing, although any shortage of, and higher prices for, beef, should help appreciably—in rather the same way as that in which the shortage in 1957–59 contributed towards the increase in consumption of chicken.

Need for co-ordination

Until recently, practically all producers catered for the Christmas market and sold their birds at what they considered the most convenient time, to the wholesalers and retailers who offered the best price. The number reared by each producer was often determined by the profitability of the enterprise the previous Christmas, rather than by current market requirements. Even so, the price of turkey has gained a large measure of stability in recent years; thanks to the Ministry's slaughtering policy to check fowl pest and to the hard winter of 1963, production has been kept in fair harmony with demand. But if future prices are not to slump, production must be allowed to expand gradually according to the needs of the market, which are likely to increase by about three-quarters of a million birds annually.

Clearly, then, the aim must be to secure a steady flow of small birds during most of the year, with a striking increase in numbers and a change of emphasis to mainly medium, and some large, birds at Christmas. Obviously some sort of control of production is necessary to ensure that the required quantities and types are available on the market when they are needed. This can be achieved only by a close co-ordination of the activities of producers, processors, and retailers. The two last are in a much better position than producers to gauge the seasonality of consumer demand, as regards quantity and size and type of bird.

Groups of producers, supplying turkeys under contract to processors, seem to represent the kind of organization necessary to link the activities of individuals among all sections of the industry, breeders, producers, and processors, and to serve the best interest of each by satisfying the needs of the market. Contract production is essential to safeguard producers' bargaining power, and to ensure a steady supply of birds of the right size and type to the

processing plants. The processors should obviously act as the co-ordinating body, but to be fully effective in this role they must have thorough knowledge both of intensive production and of the mass marketing of turkeys. Producers should ensure that they keep certain management decisions in their own hands, and that risks are adequately shared and credit facilities made available.

Eventually, such groups are likely to include only fairly large-scale producers (rearing at least 1,000 birds per batch). Most of them will probably rear annually two batches of small birds and one of medium, but some will raise two batches of medium and one of small birds.

Small producers

But what of the small producer? Whilst group formation can offer him many advantages, in the form of reductions in the prices of chicks and food and a secure market, the profit per bird from selling small live birds to processors is likely to be too low to make small-scale production worth while. Nevertheless, many small producers will presumably remain and will probably concentrate on supplying the Christmas market for fresh birds. Not only can they help to provide the additional birds needed at this season but also, by selling direct to retailers and consumers, they will be able to claim the highest possible price, and thereby to make good some of the disadvantages entailed in small-scale production.

Brought up on a smallholding, the author of this article, **W. Dyfri Jones, M.Sc.,** was educated at the University College of Wales, Aberystwyth. After a period as an Assistant Agricultural Economist in the Ministry of Agriculture, he returned to the University College of Wales in 1948 to take up his present appointment as Research Lecturer in the Department of Agricultural Economics.

Rearing Heifer Calves on Contract

A. Adamson

MANY dairy farmers whose land is suitable for more intensive forms of production still rear their own heifer calves for herd replacement. There are a number of reasons for this, but in the main it is the fear of bringing in disease when buying in the open market and the farmer's faith in his own breeding programme. On the other hand, many upland farms more suitable for rearing than milk production run a small dairy herd primarily to provide the regular income which store cattle rearing and sheep do not

A bunch of in-calf heifers on the upland rearing farm. They are due to calve next spring

Young calves, about 2½ months old, on the lowland dairy farm. Two to three weeks after this picture was taken the calves were weaned and transferred to the upland rearing farm

provide. But if two of these dissimilar types of farming could be associated —one farm carrying the rearing stock and the other concentrating on milk and corn growing—then the co-operation would be of mutual benefit.

This ideal has long been recognized by many of the larger farmers in the Vale of Taunton Deane, who have bought relatively cheaper farms in the Brendon Hills and on Exmoor, solely for rearing dairy replacements and for summering ewe flocks after the lambs have been weaned. It is only recently, however, that two separate farmers, one in the Vale of Taunton Deane and the other on Exmoor, have agreed to operate a contract system for rearing dairy replacements. Although a formal contract has been drawn up, the essence of this system (like taking ewes at halves) is mutual trust between rearer and dairy farmer.

The contract provides that the dairy farmer shall deliver weaned calves to the rearer at 3–4 months old, the animals being dehorned, suitably ear-marked and in good health and condition. The calves remain on the rearer's farm until two months before calving—that is 2½ years. The choice of bull (at present an Aberdeen-Angus) is a matter for mutual agreement.

For rearing the calves, the rearer receives £2 10*s*. per animal per month and this sum is paid monthly. The rearer bears the cost of all necessary veterinary attention (except husk vaccination costs) including inoculation with S.19.

Should any of the animals die the rearer receives the value of the dead beast but returns all rearing payments made to date. All barreners are sold and the difference between the selling price and the rearing payments is adjusted equally between owner and rearer. Contingency clauses in the agreement cover various circumstances which might arise, e.g., the rearer ceasing to farm the rearing farm; but normally the agreement can be rescinded only by a year's notice on either side. Provision is made in the contract to cover unsatisfactory rearing. Transport costs are paid by the owner.

Economic advantages to both

The benefits of this type of contract are that the stock to be reared remain in the ownership of the dairy farmer and, since no sale takes place, the fluctuation of the market does not affect either the cost of rearing to the owner or the income of the rearer.

The economic advantages to both parties are considerable. On the vale farm the land released from rearing has enabled the farmer to keep 12 more cows and grow an extra 8 acres of wheat. On Bristol University standards this provides an extra income of approximately £200 a year after paying the rearing costs. The farming system is simplified and labour requirements for looking after stock, particularly during the winter months, are less. If higher standards of production than the average are obtained, then the increase in income is correspondingly higher.

For the rearer the scheme gives a regular monthly income comparable to a milk cheque. The gross output per livestock unit per year is higher than the average for the area and no tenant's capital is required to obtain this income. The tenant can, therefore, use his available capital in intensifying his sheep enterprise or in other ways which would increase his farm income.

One problem which has arisen is accommodation for the additional cows on the vale farm; but in this particular case the dairy farmer—a tenant farmer—is blessed with a progressive landlord who is willing to equip the farm adequately. And thanks to the landlord's co-operation, even further intensification of the dairy herd is visualized.

A. Adamson, B.Sc. (Agric.), joined the National Agricultural Advisory Service in 1947, after 15 months service with the Somerset War Agricultural Executive Committee. He was, until recently, District Advisory Officer for the Taunton area before being promoted to the post of Senior District Advisory Officer in Carmarthen.

Machine milking

REPRESENTATIVES of milking machine manufacturers and the Milk Marketing Board recently attended a short training course on testing the mechanical efficiency of milking machine installations. The course was organized by the National Institute for Research in Dairying and held at the National College of Agricultural Engineering, Silsoe.

Lectures and demonstrations on farms were given by members of the Milk Group of the National Agricultural Advisory Service. Basic techniques were discussed in detail from the advisory and servicing points of view and agreement was reached on final details of test records.

It is hoped that all milking machine manufacturers will now be able to offer a uniform testing service, irrespective of make, which will be incorporated into the existing facilities for repair. Such a test will probably form part of the initial installation work, so that with subsequent tests periodically during the life of a plant a case-history can be built up by the manufacturer concerned. It is likely also that new installations will be designed to facilitate the work of testing.

It is expected that the farmer will normally approach his manufacturer for testing services, but the N.A.A.S. will continue to test machines on a limited scale, particularly where more general problems of milk production are concerned.

Why is it that some growers can get yields of 18 tons of maincrop potatoes per acre whilst others manage only 8? We put this question to

Professor J. D. Ivins

The Build-up of Potato Yields

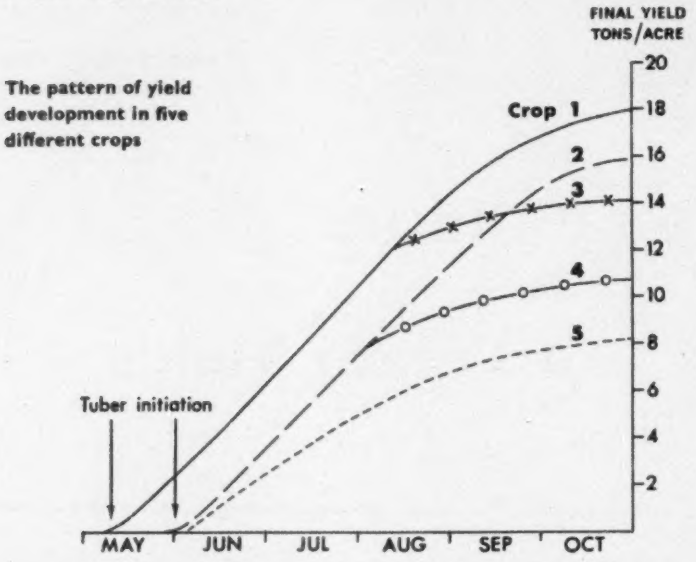
AN easy way out of attempting to explain why some maincrop potatoes may yield 8 tons per acre while others yield 18 tons would be to suggest that the 8-ton crops were grown from twice-grown seed infected with virus diseases and then to elaborate on the benefits of the seed certification scheme. Alternatively, one could attribute the lower yield to infestation with potato root eelworm and then proceed to expound the advantages of crop rotation. No doubt these are possible explanations for low yields in a few cases, but it is a complex of factors that determines crop yields. Clearly, the 18-ton crops have had most factors in their favour, but the issue is not straightforward and the full effect of some factors may not be fully understood.

Phases in the development of yield

Total yields are determined by the rate and duration of tuber bulking and thus are related to the time when tubers first start to form and to the persistence of green foliage which allows bulking to continue. Shortly after emergence of the shoots, the build-up of dry matter commences in the leaves. At this time the greater the leaf area the quicker will be the build-up of dry matter, but later a stage will be reached when there will be little advantage from increasing leaf area. Then the older leaves will be inactivated by shading and dry matter will have been utilized for leaf growth when it should have been accumulating in the tubers. Competition between foliage and tubers for dry matter can affect the rate of tuber bulking, and the balance can be swung in favour of foliage or tubers by several treatments which the crop receives. Only the question of total yield is considered here, the number and size of tubers being to some extent a separate issue.

Tuber bulking

The diagram below gives the pattern of tuber bulking for five crops. A steady bulking rate has been assumed, but in practice this may fluctuate a little from week to week.



Crop 1, yielding 18 tons per acre, initiated tubers early and had a high bulking rate over a long period. Crop 2 was two weeks later in initiating tubers and, although it had the same bulking rate as Crop 1, it never caught up and yielded two tons less per acre. Crop 3 initiated tubers at the same time as Crop 1 and had the same bulking rate at first but, owing to earlier senescence of the foliage, bulking stopped earlier and the final yield was reduced. The initiation of tubers was also later with Crop 4 and this, together with a short bulking period, resulted in a considerable reduction in yield compared with that for Crop 1. The lowest yield (from Crop 5) resulted from late initiation of tubers combined with a low rate and short period of bulking. Many other lines can be imagined on the diagram, representing other cases, and it is possible for the same yield to be produced via different pathways, particularly if results are compared over several seasons.

All yield differences may be explained on this basis. For example, Majestic almost invariably outyields King Edward, and the extra yield is gained by earlier tuber initiation with little, if any, difference in rates of bulking. In blight years, Majestic has the added advantage of longer leaf persistence, which extends the bulking period into late summer and autumn. In a year when blight attacks early, Majestic and King Edward might be likened to Crops 1 and 4 respectively, in the diagram.

The treatments which the crop receives, if they influence yields, do this through their effect on the pattern of tuber bulking. Some treatments affect more than one of the phases involved and their effects are not always complementary. For example, early planting usually results in the early initiation of tubers (an advantage for increased yield), but on occasions

earlier senescence of foliage takes place (a disadvantage), and this explains why the results of time of planting trials can vary so much from centre to centre.

Often, nitrogenous fertilizers, by stimulating leaf growth, delay the commencement of tuber formation (a disadvantage), yet nitrogenous fertilizers prolong the life of green leaves which can result in a considerable increase in yield from a prolonged bulking period. Under conditions of high fertility—say, sufficient to yield 10 tons of Majestic without added nitrogenous fertilizers—generous quantities of nitrogenous fertilizers may stimulate leaf growth to the extent that the rate of bulking is slowed down. Then the advantages of greater leaf persistence are lost and lower yields may result. Earlies do not react to nitrogenous fertilizers in the same way as maincrops. Being planted earlier their leaves emerge when conditions of temperature, light intensity and day-length are less suitable for leaf growth. They also have early tuber initiation as a varietal characteristic, and with earlies copious leaf growth is rarely made at the expense of tuber bulking.

Drought, blight and weeds

Drought results in reduced bulking rates and irrigation affects the development and growth of the plant in similar fashion to nitrogenous fertilizers. Irrigation before tubers have started to form stimulates the growth of leaves and may result in a reduction in yield of tubers via delayed tuber initiation. The most profitable response results when crops are irrigated immediately after tuber initiation, which is usually early enough to prevent the effects of drought.

Apart from tuber infection and subsequent rotting, blight causes losses by destroying the foliage. This shortens the bulking period and results in loss of yield. Spraying, which helps to retain the foliage, generally results in increased yields and, in a wet summer, varieties which are resistant to blight on the foliage give higher yields than susceptible varieties. Unfortunately, foliage resistance to blight is not always accompanied by tuber resistance.

Weeds, depending on their vigour, bring about a reduction in bulking rates via competition for light, nutrients and water. Cultivations to eliminate these weeds give increased yields, but beyond the elimination of weeds, cultivation of the growing crop has little, if any, effect on yield. During hot, dry weather moisture may be lost as a result of continued inter-row cultivations and, in consequence, yields may be reduced.

High yields

The potential 18-ton crop would have to be comparatively free from fungal and virus diseases and pests. The varietal characteristics would have to impose no limitations up to this point, the soil fertility would be high and water supply adequate. The realization of the potential would then be dependent on the relative effects of management treatments on the rate and duration of tuber bulking.

Professor J. D. Ivins, M.Sc., Ph.D., is Dean of the Faculty of Agriculture and Horticulture at the University of Nottingham and a member of the Advisory Committee of the Ministry's Gleadthorpe Experimental Husbandry Farm. He was Technical Officer, and later Regional Trials Officer, at the N.I.A.B. before going to Nottingham University, originally as Lecturer in Agriculture. Much experimental work on potatoes has been done at the University's farms at Sutton Bonington, and the theme of the 1963 Easter School at Sutton Bonington was 'The Growth of the Potato'.

PIGMAN OR PIGMY?

W. A. R. Harris

has something to say about time wasted in the piggery

Pig Housing

the fundamental approach

To succeed, you must first ask the right questions.—ARISTOTLE

IF there is one branch of farming which has been particularly influenced by work study it is pig management. This may not be altogether surprising since pig keeping is one of the few farming enterprises that benefits materially from rationalized methods and to which the industrial approach can be readily applied.

Everyone interested in pigs is now familiar with 'off the floor feeding', which is being adopted on an ever-increasing scale. Yet it is not generally realized that this is just one technique developed as a result of work study investigations, a prominent part having been played by W. J. Pinfold, an A.L.S. pioneer in this field. In addition, space standards in piggeries for defined conditions, now freely quoted by the majority of respected authorities on the subject, have been crystallized and established to the satisfaction of most people.

It is now understood that the pig man is just as important as the pigs; indeed, if adequate facilities in the way of buildings and equipment are not provided, profits are going to suffer. Even if the 'little pig' under these

conditions does eventually 'get to market' it will not be long before the pig man stays at home! Once a routine and method of management have been devised in line with modern standards of husbandry, a building can be designed without too much difficulty for processing barley meal into pork chops.

Inefficient labour

It may be argued that work study sets out primarily to economize in labour. If food accounts for 80 per cent of production costs in pig production, why worry about a small saving in time? What those who argue this way do not realize is that the efficient distribution and utilization of food is directly influenced by the quality of the labour. In other words, an inefficient pig man may well increase food costs above the 80 per cent mark, purely by reason of poor organization—not fully exploiting the available facilities and resources, not being able to take an impartial view of the job. The work study man's approach will be systematic, analytical and objective. There is a fair amount of truth in the saying 'the onlooker sees most of the game', but it is not enough to be critical; one must be constructive and show how the 'play' might be improved.

If a man is hard pressed to carry out his job in his accustomed manner, every minute of his available time is spent completing the job somehow. He is so intent in getting through the mechanics of the job that he has little time for the most rewarding of all—stockmanship.

As in most livestock enterprises, the feeding of the animals and the removal of manure are the most time-consuming operations. No man can give of his best if he is tired mentally or physically. Because a man works on a farm there is no reason why he should be dead on his feet as a matter of course. It may not seem to be much when you say five minutes have been saved, but if those five minutes were spent continually walking, perhaps carrying a heavy load or working in an unpleasant atmosphere, it may mean all the difference between passive acceptance of the job and alert enthusiasm. It is difficult to measure cumulative effect, although it is apparent.

Feed preparation

Bearing these factors in mind, how have piggery management and design been affected? First, let us take food preparation. On a number of farms that have been studied, ingredients for the pig ration have varied from one to twelve, according to the degree of pessimism of the farmer! Usually the foods were stored either loose or in sacks in any available space, often unlabelled, and with the ingredients used first and most frequently furthest from the mixer. There was no uniformity in the units of weight of various ingredients, thus making it necessary to split sacks and weigh out the correct amounts instead of using the whole sack as a unit of weight. When the various sacks were finally assembled, after delays caused in hunting for the knife hidden by a gremlin between each trip, the mixer-hopper was at such a height that the sacks had to be man-handled in order to empty them.

While indulging in this 'savage amusement' with the minor ingredients, the whole barley was usually being milled (sometimes with the straw and part of the subsoil as well) with a deafening clatter. Invariably, on examination, the sieves were found to be worn—the holes often nearly closed. The time taken

to mill always governed the whole operation and this in turn was influenced by the size of the sieve. Was it necessary to use the $\frac{1}{16}$ in. sieve in general use? Would a more coarsely ground meal have any detrimental effect on the pig or its conversion? By increasing the sieve size to $\frac{1}{8}$ in. the time taken on this operation would have been nearly halved. Apart from such advantages as easier handling and feeding, there would have been less likelihood of waste and no longer would the pig man or the pigs have looked like fugitives from an exploding flour-mill every time a sack or bucket was emptied. The answer was in favour of coarser grinding. As for the necessity to use ten or twelve ingredients, the consensus of opinion of the nutrition specialists suggested three or four would be enough. These two innovations meant that food preparation and storage were very much simplified. It meant that it was now quite possible, if desired, to use the mill for mixing as well as milling; also the main ingredients could be stored in bulk. Besides minimizing handling, assuming comparatively small amounts, the feeding trolley could be filled directly from the mixer; otherwise it would be worth while conveying the mix direct from mixer to a self-emptying storage hopper.

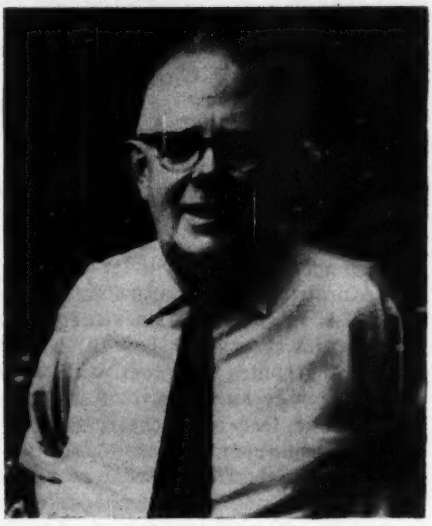
Minor details such as receptacles for used sacks and string placed conveniently close to the point of use, easily read ration or instruction cards and notices, warning devices, accessible switches for lights and machinery and adequate safety precautions would have been rather obvious modifications! It may have been more complicated to discover the need to provide loading ramps or platforms or means of access from one room to another or between buildings.

In the farrowing house

In the farrowing house all efforts are concentrated on the safe arrival and survival of the piglet. Here supervision cannot be neglected. No physical or psychological barrier should prevent the pig man quickly scrutinizing and performing the routine tasks on the small pigs, either in the creep or elsewhere in the pen; the creep should adjoin the feeding passage. In short, if farrowing pens are indoors easy supervision is the key factor once the physical comfort of the pig has been assured. It is debatable whether the capital expenditure is necessary for the comfort of the pigs or the men who may have to be in attendance on a frosty winter's night. Work study has helped in the layout of arks, either for farrowing or dry sows (e.g., radial layouts), but it is obvious that if dry meal is fed to pigs in outdoor yards, there is a likelihood of food wastage through treading, fouling and blowing. Steps should be taken to prevent or minimize this.

The second part of this article will appear next month

He put a value on Grass



the story of Arthur S. Cray

D. J. Columbus Jones

SAM CRAY started farming for a second term on his own account in 1940 when he took over Southdown Farm, Medstead, near Alton in Hampshire. He combined this farming enterprise with his duties of Production Manager of the factory of Cow and Gate Ltd., and every morning, before leaving for his office at Guildford, he would be found attending to the milking of the cows and and organizing the farm work for the day. He continued this duty until his son John came home from the Royal Air Force in 1957. His second son, David, also helped in between his studies at Reading University, but he now manages a farm in North Cornwall with intensive sheep-keeping as the main enterprise.

Mr. Cray was born on a cheesemaking and mixed farm at Rode on the Wiltshire-Somerset border. He was dedicated to a life of farming and, with his brother, took over the home farm on a partnership basis in 1920. But

three years later the estate was broken up and sold and it was in anticipation of this sale that he joined Cow and Gate Ltd. (then the West Surrey Central Dairy Co. Ltd.) as a milk tester at one of their Dorset factories. From this small beginning he established himself very quickly in this new role. His energy and foresight gained him quick promotions through Assistant Factory Manager to Area Manager and then to Production Manager for all the factories of the Group.

It started with whey

In 1950 the Group's cheese factories in the various parts of the country were finding it difficult to dispose of whey, and it was arising from this problem that Mr. Cray became responsible for the formation and subsequent development of Cow and Gate Farms Ltd. He became its Chairman and Managing Director.

The formation of the Farm Company was an attempt to turn this surplus by-product to good use. The success of this project can be gauged by the fact that this company is now the largest pig feeding and fattening enterprise in the United Kingdom, with farms in Dorset, Somerset, Cornwall and Carmarthenshire. This result goes to show the keenness and organizing ability of Mr. Cray in whichever direction he turned his attention. Between all the farms he controls there are now pig stocks numbering around 18,500. Little wonder, therefore, that he became more pig-minded!

In the early stages the number of problems with which they were confronted in perfecting a system of whey usage by pigs were quite alarming, but by perseverance and co-operation with scientific workers in the field of feeding and pig health, some progress was made. This in turn led to closer touch being established with research workers in the field of A.I. for pig progeny testing and pig health records. One of Mr. Cray's great assets to research workers is his keen interest in keeping and maintaining detailed records of all happenings concerned with any activity on the farm that interests him.

Interior view of a farrowing house on one of the farms supervised by Mr. Cray

His interest in pigs, so stimulated, is further exemplified by his being a governing member of the National Pig Progeny Testing Board since its inception, and since 1960 he has been its Chairman. He was also a founder member of PIDA and is still a member at this date.

In recognition of his pioneer work with pigs and his readiness to pass on his successes and results to others, he was recently awarded the 1963 David Black award for 'the person adjudged to have made the greatest contribution to the British Pig Industry'.

Although pigs were perhaps the key to the original idea of these farms, Mr. Cray has also included other activities—dairy cows, beef units, and sheep with some arable.

Grazing on clay

Reverting to Southdown Farm, now the family home farm, one wonders how Mr. Cray can find time to think about it apart from directing the activities. But so great is his energy that here again he has excelled in converting a poor 'run-out' farm into one of the leading enterprises in the country for grassland development.

Southdown Farm lies almost entirely between the 600- and 700-foot contours and is typical of Hampshire clay cap land. For most part the chalk is 10 to 25 feet down, so that the soil is slow-draining and subject to severe damage by poaching. When he took over the farm the grass was badly run out and soil analyses showed serious deficiencies in all respects. In addition the fences were poor and no water was available other than rainwater conserved in underground tanks.

This was the challenge and task which Mr. Cray faced, but he took it in his stride and adopted a policy of regular liming, liberal use of fertilizers and ploughing out the old grass to be eventually replaced by leys. At an early stage in the planning the fields were divided into smaller areas of 7–8 acres each, so allowing easier control of grazing. Water was also laid on so that the setting was now ready for the establishment of an economic size dairy herd—Mr. Cray's ultimate aim.

As usual, Sam Cray had set his mind on getting to know all he could about grass and farming grass. He sought all the advice he could get and followed the developments of Stapledon's work at Aberystwyth and Drayton.

Whether it was beginner's luck or not, the first long ley he established at Southdown was a great success and he was very proud of it because he had done the sowing himself.

Within a matter of a few years the experience obtained at Southdown with grass leys set the pace of development for the future. He was a very apt student of the modern school of grassland development and soon at Southdown one saw the practice of direct sowing of leys, the use of ultra simple grass clover seed mixtures, with leafy strains and many other refinements in the better management of grass.

Putting it on paper

It was realized at an early stage that the stocking capacity of the land in new grass had to be increased. This led to Mr. Cray's effort to try to evaluate the improvement he had effected. Detailed records were kept of the stocking and grazing of all fields on the farm. Examination of these records revealed interesting results, which encouraged Mr. Cray to introduce

The low-cost, but high-quality, 'Crayplan' house was one result of the research into pig housing which Mr. Cray pioneered

more refinements in the matter of classifying the various types of stock and allowing for concentrated food fed for milk production.

He perfected a system of recording the performance of grass fields in this way and the system is used today as a standard method under the name of Utilized Starch Equivalent.

The meticulous way in which he personally kept these records and interpreted the results aroused widespread interest. For the first time visitors over the farm were told the results of the production of individual leys, comparing one field with another and with the old grass.

In this way *he put a value on grass* utilized through the grazing animal or conserved as hay or silage. He made use of grassland recording on many platforms throughout the country and expounded with great enthusiasm on what grass could do if properly treated and managed. Today Southdown Farm has become something of a farming 'Mecca' for visitors, parties and demonstrations. In 1956 Mr. Cray was elected the first Farmer President of the British Grassland Society, an honour recognizing his great contribution to the advancement of grassland development in practice.

Although many other farmers have adopted his methods and found them successful, grassland development still goes on at Southdown Farm and there is always plenty to interest all grassland enthusiasts such as variety of leys, fertilizer treatments, stocking management and winter feeding.

Leading thinker on grassland

Discussing grassland with Mr. Cray reveals at once a keen pioneer who seeks for the answers to many problems of our times, whether technical or economic. The results of his keen observations and experience in grassland matters is always interesting and practical. He invariably emphasizes that a grass farmer should look upon his grass as a crop in much the same way as the arable farmer looks upon his wheat or other crops. This dogma leaves no room in his methods for undersowing the grass crop, hence all the long leys at Southdown are direct sown so that there is no doubt of their establishment not being good from the earliest stage of their growth.

Adequate fertilizer treatment of phosphate and potash is practised, and particular emphasis given to nitrogen application. The rate of nitrogen fertilizer has now reached the 200 units of nitrogen per acre and is likely to go up to 250–300 units N in the next few years. In the result the leys are thriving under this management; they are as good in their third year as

in their first. In view of this much thought is now being given to the gearing of the farm economy to leaving the leys down for much longer periods—that is, as long as they remain highly productive.

The greatest commendation of Sam Cray's pioneer efforts for better grassland and the recording of its output is the widespread adoption of his views and methods. The demand for his services as a speaker for modern grassland development is much sought after and he has given the initiation addresses at no less than seven newly-formed County Grassland Societies.

Other honours have rightly come to him—the M.B.E. in 1953 and Justice of the Peace for the Alton Division in Hampshire 1954.

Finally, perhaps one of the most valued treasures at Southdown Farm is a white tablecloth on which appears the 'facsimile' of over a hundred signatures of world-famous grassland enthusiasts who have visited Southdown Farm over the years. These signatures have been dexterously worked in coloured cottons by Mrs. Cray. It is noteworthy that the central signature is that of Sir George Stapledon.

D. J. Columbus Jones, O.B.E., M.Sc., is Regional Grassland Adviser in the South-Eastern area of the N.A.A.S., and is stationed at Reading. He was brought up on a mixed farm and trained at the University of Wales, Aberystwyth, under the late Sir R. G. Stapledon. Before joining the N.A.A.S., Mr. Jones was for 11 years Technical Adviser to Messrs. Sutton and Sons Ltd. and County Technical Officer for Hampshire for six years. He has made a special study of grass varieties and herbage seed production.

Late bite

THE back-end of the year is not notable for a plenitude of fine-quality grass, yet many farmers could find solace and profit by providing at least some measure of late grazing. This is the message from a new little book issued by I.C.I., *Facts about Late Bite*, which proceeds to show by figures from recorded farms that an application of nitrogen in August/September is a really valuable technique for getting the most from grass and stock—beef and dairy.

The main benefits are listed as a saving of expensive concentrates, of valuable winter feed, and of labour and bedding where housing is the only alternative.

Poaching may happen on some soils—but less often, it is said, than some farmers fear.

Certainly the figures quoted in this booklet, which is obtainable free from Jealott's Hill Research Station, Bracknell, Berks, are well worth study, especially when you consider the claims that, on dairy farms, margin over concentrates and fertilizer can be £5 per cow higher when late grass is available; and on beef farms, late grazing can result in a saving in food costs amounting to £1·5 per cow.

It is too late to do anything about it this year, but next autumn may present the same problems. *Verb sap.*

FERTILIZER APPLICATION
•
BEANS IN CEREALS
•
SYSTEMIC INSECTICIDES
•
NITROGEN ON GRASS

Research at Rothamsted

Sylvia Laverton

WITH increasing mechanization of arable farming, the value of drilling fertilizers for cereals and of fertilizer placement for other crops is being questioned. Separate fertilizer application before sowing or planting, especially with a spinning disc distributor that gives a wide swath, is attractive because it speeds spring work. Experiments have therefore been made at Rothamsted to obtain more information about the gains associated with special methods of applying fertilizers.

In a barley crop that received its nitrogen as sulphate of ammonia broadcast over the seedbed, the relative merits of broadcasting or combine drilling a PK fertilizer were determined in terms of green barley and grain harvested. Two levels of N were used: 0·35 and 0·70 cwt per acre. The PK fertilizer supplied 0·5 cwt of P_2O_5 and 0·5 cwt of K_2O per acre. Greater increases in yield of both harvests were obtained when the PK fertilizer was combine drilled than when it was broadcast, the effect being more marked with the lower level of N.

In four other barley experiments, two NPK fertilizers were used, one of which contained twice as much N as the other. Their percentage $N : P_2O_5 : K_2O$ compositions were 20 : 10 : 10 and 10 : 10 : 10 respectively. Each was tested broadcast over the ploughed land and combine drilled, in amounts that provided N at the rates of 0·3, 0·6 and 0·9 cwt per acre. Two of these experiments were on clay loams, one was on chalk and one on sand-and-gravel.

Combine drilled, 10 : 10 : 10 checked early growth much more than a dressing of 20 : 10 : 10 supplying the same amount of N. The check was severe with the medium dressing and even greater with the heaviest dressing. But by harvest time the damage was no longer discernible, except on the sandy soil. Nevertheless, when the yields were measured it was apparent that, with the exception of the heaviest dressing of 10 : 10 : 10 on the sandy soil, each fertilizer produced more grain when drilled than when broadcast.

The gain from drilling was greatest with the smallest application rate of the 10 : 10 : 10 fertilizer and with the medium rate of the 20 : 10 : 10 compound.

In these experiments, the yield of grain (15 per cent moisture) was 19·5 cwt per acre without fertilizer; combine drilled, the smallest application of 10 : 10 : 10 gave 30·1 cwt and the medium rate 36·5 cwt per acre, as compared with 26·6 and 33·8 cwt per acre respectively for the same fertilizers when broadcast.

In three potato experiments large dressings of an NPK fertilizer (13% N; 13% P_2O_5; 20% K_2O) were used. Placing only 5 cwt/acre of the fertilizer in two bands at each side of the seed gave 11·6 tons/acre, a slightly better yield than from broadcasting the same amount over the seedbed or rotavating it into the soil. With dressings of 10 and 15 cwt per acre, broadcasting and working in the fertilizer gave the greatest total yield of tubers—13·1 and 13·8 tons per acre from the two rates respectively, as compared with 11·9 and 11·1 tons respectively from side-band placement.

Beans in cereal rotations

Intensive barley growing carries less risk of loss from disease than intensive wheat growing. In 1961 a long-term experiment was started at Rothamsted to provide information about the effect of successive barley crops on yield and the incidence of soil-borne disease. Take-all affected more plants in a third successive barley crop than in barley preceded by oats and beans, but the former yielded only 2 cwt less grain when given enough nitrogen. To obtain 2 tons of grain per acre it was necessary to apply 100 lb N per acre to the third-year barley crop; after beans, 42 cwt was achieved with only 34 lb N.

Confirmed barley growers are unlikely to introduce beans as a break in successive barley crops when its good effect on the next crop of barley can be attained simply for the price of 66 lb N per acre. But in rotation with winter wheat on heavy soils, beans followed by wheat might be a more profitable proposition than two successive barley crops.

Early protection from systemic insecticides

Applying systemic insecticides to seed or to the soil at planting has several advantages over spraying. It gives protection against insect attack for young plants too small to be sprayed efficiently and, because it largely restricts insecticidal action to specific crop pests, the beneficial effects of biological control by the pests' predators are not lost.

A study of this technique applied to the control of the potato viruses leaf roll and virus Y (severe mosaic), and their aphid vectors, was completed in 1963. The results leave no doubt that the method is effective, is easier than spraying and less damaging to the crop; costs are about the same. Treating the seed or applying the insecticide to the furrows protected the growing plants from aphids for most of the critical period, i.e., for at least eight weeks after emergence of the foliage. As a result, the spread of leaf roll virus was largely or wholly prevented and that of virus Y was lessened. In this series of experiments, disulfoton and phorate granules were consistently more effective than menazon or dimethoate; with menazon, tuber treatment was more effective than granular application to the soil.

Menazon applied as a slurry seed dressing to field beans at rates equivalent to 1 and 3 lb active ingredient per acre last year successfully preve ted the

early aphid attack in a late-sown crop of the variety Herz Freya, which is particularly susceptible to the aphid-borne pea leaf-roll virus. Disulfoton granules applied to the foliage when the plants were about 18 inches high greatly checked the early aphid attack. In early July, three months after sowing, plants grown from menazon-treated seed were still slightly toxic to aphids caged on the leaves.

Systemic insecticides applied at drilling decreased the incidence of virus yellows in sugar beet seed crops more than those applied after emergence, because there was a very early aphid infestation. Sugar beet and mangel seed growers were quick to appreciate the value of this technique for summer-sown stecklings: in 1963 most steckling beds were sown with menazon-treated seed.

N fertilizer and soluble carbohydrates in grass

In view of the recently observed association between palatability and digestibility of grass and its water-soluble carbohydrate content, it is interesting to note that in an experiment with cocksfoot, increase in the amount of nitrogen fertilizer applied decreased the total soluble carbohydrate in the grass considerably, but increasing the level of potash had no effect.

These and many other subjects under investigation at the Rothamsted Experimental Station are dealt with fully in the Station's Report for 1963, *price* 15*s.*

CHEESE, SIR?

English, of course!

STILTON

King of cheese

Ruth Dawson

For all that Stilton is acclaimed 'the King of Cheese' because of its superior quality, it doesn't come from Stilton. True, it derives its name from the Huntingdonshire village, but there is no evidence to show that Stilton was first made there. It is reported to have been made on farms in the Vale of Belvoir and offered for sale locally—in particular at the Bell Inn, Stilton, on the Great North Road. Originally, the cheese was a white variety but later

The curd, contained in metal sinks, is cut into 9-inch blocks to allow the whey to escape

it was found that if the cheese was left longer to mature blue veins developed, which gave it a distinctive flavour. Stage-coach travellers bought the blue cheese, and so its fame spread, becoming known as 'that cheese from Stilton'. When the cheese is cut across for serving with a spoon it will dry on exposure to the air if not eaten within a few days. It became the custom, therefore, to add port to moisten it, and this, no doubt, was an added attraction for those early travellers who wined and dined at the Bell Inn. But this practice of adding port is frowned upon by cheese connoisseurs, because, they say, the wine masks the true flavour of the cheese.

Nowadays Stilton, both White and Blue, is manufactured in creameries on a much larger scale than on farms a century ago. But, unlike some of our English cheeses which are now manufactured in areas far removed from their place of origin, the making of Stilton has remained in its own area—Rutland, Leicestershire, Derbyshire and Huntingdonshire.

Skilled making

Stilton, as with other English cheeses, is made under strictly controlled conditions to ensure a satisfactory end product. The skilled maker is essential. Laboratory control is necessary, and trained staff test the incoming milk supplies to make sure they are suitable for Stilton cheese. Strict attention is paid to hygiene and all equipment must be thoroughly cleansed.

Milk of high quality is used and is first of all heat treated to a temperature of 158°F. This ensures killing the bacteria in the milk which could cause faults in the finished cheese. The milk is then cooled to 86°F before it flows to vats holding 800–1,200 gallons.

'Starter', which is a pure culture of sour milk, is added to produce acidity, then rennet to form a junket. Some 60–90 minutes later the curd is firm enough for cutting. Special knives with vertical and horizontal blades are used for cutting, so giving ½-inch cubes. This allows the whey to separate from the curd, a portion of the whey being drawn off at intervals over a period of up to four hours.

The acidity of curds and whey is regularly checked by means of a simple test and is a guide to the maker as to the progress of the cheese. At a suitable acidity level the curd is scooped from the vats on to Stilton sinks. These sinks

CHEESE RIPENING ROOM

In the background a cheese is being pierced mechanically with steel skewers.

In the centre a bore is being taken from a cheese to assess its quality.

In the foreground cheeses are being 'plasticoated' ready for export. A liquid plastic, specially prepared for cheese, is painted over the cheese with a sponge. When dry it forms a thin coat, giving a smooth, shiny finish and good appearance. This is always done for export. The cheeses are easy to handle in this form and do not crumble or flake and cause 'dust'

may be of metal or porcelain, up to 20 ft long, 2 ft wide and 14 inches deep, with metal perforated trays in the bottom to allow whey to escape.

After one hour the curd is cut into 9-inch blocks and turned over. The blocks are allowed to drain and at intervals are cut and turned again until the correct curd condition is reached. The curd is kept at a warm, even temperature throughout drainage.

The curd is then milled to the size of walnuts and mixed with salt before filling into the hoops. These hoops are metal perforated cylinders 15 inches deep and 9 inches in diameter, and they give the cheese its characteristic shape and size. About 24 lb of curd go into each cheese.

The hoops are left to drain on shelves, being turned daily for even drainage. After a few days the curd shrinks from the sides of the hoop and the hoop is removed. The cheese will then stand without support.

At this stage the cracks which appear in the sides of the cheese are filled by scraping with a knife, before the cheese is removed to the coating or drying room. Here the cheese remains for a few days until a coat or rind begins to form. Then it is taken to the ripening room.

Blueing

In olden days the Stiltons were left to undergo natural blueing, the mould spores of *Penicillium glaucum* entering the curd from the atmosphere, from equipment or growing in the cracks between adjacent pieces of curd after hooping. In modern practice, however, blueing may be either natural or artificial. In both cases the mould growth is helped by piercing the cheese, 4–8 weeks after making, with steel skewers to admit air and so get quicker blueing. The ripening period is therefore shorter than it was; the blue veins

develop more quickly and the cheese is ready for sale earlier—8–12 weeks, as compared with months of natural ripening without piercing.

Where blue cheese is made continuously, the atmosphere contains mould spores, and these will enter the milk and curd to give natural blueing. If artificial blueing is practised, then spores of the mould *Penicillium roqueforti* may be bought (referred to above as 'Pen. Glaucum', which is the name in old literature). These spores are specially grown and prepared ready to be added to the curd at salting, therefore ensuring that the curd contains mould spores, with nothing left to chance.

For a White Stilton, alterations are made during making to give a drier curd and the cheese is sold earlier, before blueing can take place.

Throughout the making and ripening of the blue Stilton, changes take place in the cheese to give the characteristic soft, creamy, spreadable texture with fine blue veins throughout and the special Stilton flavour which we recognize. When this stage is reached and before sale, the cheese is examined for quality. This is judged by taking a bore of cheese, and the expert cheese-maker may judge the quality by smell rather than by taste.

Besides an appreciative market at home, Stilton cheese is also exported. It may be sold whole for cutting as required in the shops, but the small prepacked wedges and pots or cartons of Stilton are becoming popular. Christmas is the time of its greatest popularity.

Stilton may realize twice the price of other cheese varieties—hardly surprising when we remember the special care and treatment it must have to give the superior quality so long associated with the 'King of Cheese'.

Miss Ruth E. Dawson, N.D.D., is the Senior Lecturer in Dairying at the Lancashire Institute of Agriculture.

Footnote for Gourmets

Readers may be interested to know that the English Country Cheese Council has published two delightful little books for those who prize English cheese as an incomparable food in itself taken with a hunk of bread and a pint of beer, or the accolade to a meal accompanied by a glass of wine. Their titles are 'English Cheeses of the South and West', written by John Arlott, and 'English Cheeses of the North', written by Ambrose Heath; 6s. each from the Council, 145 Charing Cross Road, London, W.C.2. Both are illustrated with exceptionally good colour plates.

G. H. BEARD and A. LESTER-CARD

report on another Somerset enterprise

Intensive Beef from Shorthorns

It was three years ago that Mr. Philip House of Cloford, near Frome, first took a serious look at the Rowett experimental data on intensive concentrate feeding of young beef cattle. The farm had already achieved an above-average level of arable crops, and carried a pedigree Dairy Shorthorn milking herd of 90 cows besides intensive pig and poultry enterprises, but Mr. House wanted yet another means of improving farm income.

Most of the early experience in barley beef had been gained from the Friesian steer. Little was known of the comparative performance of other breeds; but some 45 bull calves were being born every year on this farm and an ample supply of similar type calves were available locally at realistic prices, so it was decided to make a start.

The home-bred calves are from cows with plenty of size and substance, and which have averaged 10,274 lb at 3·67 per cent B.F. The calves bought in to make up the necessary numbers are usually Shorthorns, selected for strength of bone and width of back, plus a few Hereford and Charolais crosses. These have been bought at an average price of £13.

Since 1961 about 300 of these cattle have been sold fat and 187 have been weighed monthly and food recorded. The latest 102 animals to go to slaughter have averaged 496 lb dressed carcass weight at 35·86*d.* per pound.

Rearing

The Philip House principle is to wean the calves early by allowing 6 pints of whole milk for 28 days, which is then progressively reduced until the calf is weaned at 5 weeks (more recently extended to 6 weeks). A farm-mixed early

weaning concentrate is offered from 14 days, and this is fed in increasing quantity up to 12 weeks, when the calves consume about 6 lb daily. Hay is always available.

This system is similar to that used for rearing the dairy replacements and worked perfectly satisfactorily on the first few batches of beef calves. Subsequent groups began to show a drop in liveweight gains and a greater frequency of scouring and coughing. This trouble has been ascribed to the doubling up in the number of calves reared, which has meant that little or no rest could be given to the calf-rearing premises. The problem was tackled in two ways.

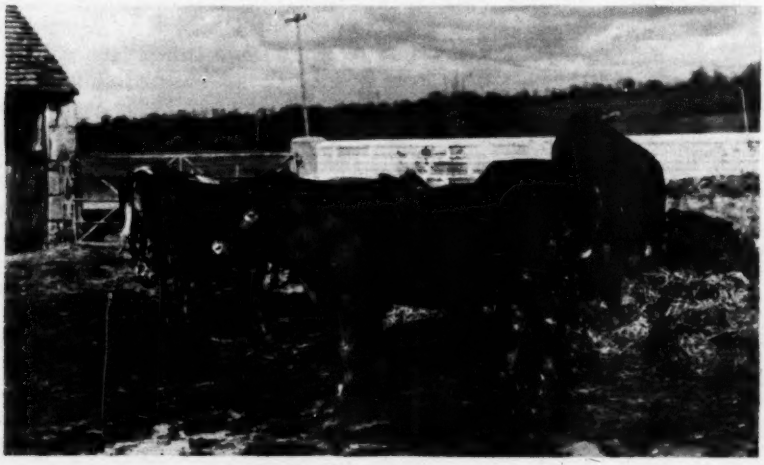
First, until new premises could be built the beef calves were allowed whole milk at 8 pints per day for 8 weeks, instead of 6 pints for 4 weeks, plus the early weaning ration as before. This extra milk gave a much better start to the calves and was reflected in their subsequent progress. It should be mentioned that this rearing programme occurred in late summer 1963 at a time when prospective milk prices were not encouraging.

Secondly, as a long-term measure, a new rearing house has been built from an old single-range cowshed, giving space for the rearing of 36 calves in pens of three. All the pen divisions, which are collapsible, are of metal and have been made on the farm. The temperature of the building is thermostatically controlled. It is intended to use this new building mainly for winter rearing and to rest it during the summer, when the old calf-rearing premises will be used. By alternating the rearing in these two houses, it is hoped to reduce infection to the minimum, and obviate the necessity of an expensive whole milk feeding period, though probably milk will still be fed up to six weeks of age for the beef calves to promote maximum growth.

Finishing

Though based on a high consumption of rolled barley, a true 'Rowett' ration is not used. A production ration of cereals, proteins, minerals and vitamins is fed at 6 lb per head per day, and in addition rolled barley is available *ad lib.* Thus, provided each animal consumes the 6 lb of production

Some of the beef animals on Mr. Philip House's farm



THE FIGURES

PHYSICAL DATA

*Average live weight of calf at birth (or purchased)	97 lb
Average live weight of finished animal	912 lb
Liveweight gain (per animal)	815 lb
Days from birth (or purchase) to slaughter	381
Average daily liveweight gain	2·14 lb

*This figure relates to a sample weighed immediately before slaughter. Facilities do not exist for weighing every animal at this time.

FOOD CONSUMPTION (per animal)

Milk	24 gal	(56 gal on revised rearing method used for a recent batch)
Early weaning mixture	2 cwt	
Production mixture	15·9 cwt	
Rolled barley	16·8 cwt	
Hay	6 cwt	

Conversion ratio (concentrate to liveweight gain) 4·46 : 1

THE RATIONS

Production mixture

2 cwt Proprietary dairy concentrate
2 cwt Decorticated ground nut cake
2 cwt Linseed cake
1 cwt Coconut cake
3 cwt Flaked maize
2 cwt Maize meal
6½ cwt Rolled barley
1¾ cwt Molassed dried grains

Early weaning mixture

5 cwt Proprietary concentrate
11 cwt Flaked maize
3 cwt Rolled oats
1 cwt Molassed meal

Analysis: 86·9% Dry matter. 20·9% Protein. 1·2% Fibre. 3·1% Oil.

FOOD COSTS

	£	*s.*	*d.*
Milk @ 2*s.* 8½*d.* per gal	3	5	0
Early weaning mixture @ £44 10*s.* per ton	4	9	0
Production mixture at £28 6*s.* 3*d.* per ton	22	10	0
Barley @ £20 per ton	16	16	0
Hay @ £12 per ton	3	12	0
Total food cost	£50	12	0

RETURNS

Average price realized (including guarantee payment)	74	2	10
Calf subsidy	9	5	0
Total return	83	7	10
Less cost of calf (or valuation)	11	10	0
	71	17	10
Margin over Calf and Food Costs	**21**	**5**	**10**

ration, it should receive the correct protein diet for maintenance and growth, the extra weight gained being derived from increasing barley consumption.

In practice it is found that liveweight gains are more variable than is desirable, and it may be that individual animals are not getting their full production ration and are consequently on a protein-deficient diet if most of their intake is from the rolled barley. The average consumption of rolled barley increases from introduction at 12 weeks to about 10 lb per day at 8 months and remains fairly stable thereafter. It seems that with the Shorthorn steer maximum appetite is in the region of 16 lb concentrates per day, and this is attained half-way through the finishing period.

Barley for rolling is both home-grown and purchased, the bought barley being of 18 per cent moisture content when possible. Hay is always on offer and ample straw is used for bedding. Very little straw is eaten by the cattle, and hay consumption does not exceed 2 lb per day.

After rearing, the calves are grouped either in old boxes or pens in a rearing house. As space becomes available they go for finishing into covered yards; some of these are not available during the winter, as they are then used by the milking herd. In the yards, 40 or more cattle are in one group.

Health

Considering the number of animals involved, the general pattern of health is good and the few exceptions must not be over-emphasized. Undoubtedly the most serious hazard is that of lung infection. Reference has been made to some coughing amongst the young calves and this has continued to the later stages in some animals. In most cases little distress is apparent and certainly the weighbridge does not reflect impaired growth. During the current year, however, there have been four animals, two of which died and two were slaughtered, where the condition suddenly turned into acute pneumonia described by the veterinary surgeon as a type of 'fog fever'. All four cases occurred in one week in late November when they were within one month of finishing.

Apart from some scouring in young calves, mentioned earlier, the only other digestive disturbance noted has been a few cases of 'brown scours' in older animals associated with changes in the barley, particularly where a very dry sample was used. Bloat has not been a problem, although occasionally an individual animal showing symptoms has been drenched.

About 5 per cent of the cattle show some signs of lameness. This is more severe than purely overgrown hoof which is present in many and seems to be a natural outcome of the system. The lame cattle have a peculiar stiff and forward gait with the fore-legs and are obviously uncomfortable, the fact being reflected in a reduced liveweight gain. At present no treatment has been applied to these cases, though two individuals were so unthrifty that they were culled from the group and put out to grass where they recovered.

Neither blindness nor the urinary troubles sometimes associated with this system has been observed.

At the abattoir several livers have been condemned for human consumption as the tissue was at a stage of almost complete breakdown, but no disorder due to this has been apparent in the cattle whilst alive.

The food costs given are for all the food consumed, so that the margin over calf and food costs is virtually the gross margin figure, except for minor miscellaneous items such as veterinary costs, etc. It will be seen that the

system compares very favourably with the more traditional methods of beef production, but has the added advantage that it makes no demands on the grassland acreage of the farm, leaving this available for milk production.

G. H. Beard, N.D.A., N.D.D., is County Livestock Husbandry Officer for Somerset. The son of a Nottinghamshire farmer, his first public appointment was with the West Sussex County Council in 1939. He joined the N.A.A.S. on its inception in 1946, and served in West Sussex and Northamptonshire before moving to Somerset in 1961.

His co-author, **A. Lester-Card, N.D.A., C.D.A.,** is the District Advisory Officer for the Bath area. After training at Seale-Hayne Agricultural College, he worked for a few years on a farm before joining the N.A.A.S. in 1950.

The Ministry's Publications

Since the list published in the September, 1964, issue of *Agriculture* (p. 429), the following publications have been issued.

BULLETINS

No. 42. Feeding Dairy Cows (Revised) 4*s.* (by post 4*s.* 5*d.*)

Contains practical advice to help the farmer produce the maximum amount of milk at a minimum cost. The selection of foods and the various aspects of feeding management are discussed, and there are tables setting out equivalent allowances of foods for different periods of time, maintenance requirements of various breeds, and the nutrient content of feedingstuffs.

ADVISORY LEAFLETS

No. 533. The Warble Fly (New)

FARM MACHINERY LEAFLETS

No. 27. Potato Harvesting with Complete Harvesters (New) 6*d.* (by post 9*d.*)

OTHER PUBLICATIONS

Report on the Animal Health Services in Great Britain 1961 and 1962 (New) 7*s.* (by post 7*s.* 9*d.*)

FREE ISSUES

Obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner

Warble Fly

Single copies of Advisory Leaflets, up to a maximum of six different leaflets, may be obtained free from the Ministry (Publications), Government Buildings, Tolcarne Drive, Pinner, Middlesex. Copies beyond this limit must be bought from Government Bookshops (addresses on p. 492), price 4d. each (by post 7d.). Other publications are obtainable from Government Bookshops, from Divisional Offices of the Ministry or through any bookseller.

Sugar Beet Harvesters

MOST harvesters are designed to top one row of unlifted beet whilst lifting the row which has been topped. The beet are cleaned in the machine and then elevated into a trailer pulled by another tractor alongside the harvester, or into a self-emptying hopper built into the harvester, or into a container mounted above the tractor. The two latter methods could be particularly useful to smaller farmers.

The trend is toward tanker harvesters because they reduce the number of wheelings over the field, show quite big savings in labour and tractor requirements, and on light land the output is about the same as by machines with a trailer running alongside. If soil conditions are really bad, then some makes of machine can be used with trailers allowing the beet to pass straight through the tank, thus keeping down the weight on the machine.

Machines are mainly semi-mounted, as they can be heavier, have more extensive cleaning mechanisms and can incorporate the self-emptying hoppers.

If a tanker model is being considered, it is useful to remember that for a 20-chain (440 yd) loading distance, in a 15-ton crop (20-inch rows), a hopper of about 15-cwt capacity is required.

One make of harvester loosens the beet with the shares, and the tops are then gripped between two rubber belts and topped in the machine clear of the ground. This arrangement reduces the number of moving parts in contact with the soil, but the efficiency depends on strong 'tops'. In periods of drought or after severe frost these machines may be in difficulty.

Usually lifting is done by two fixed shares which squeeze the beet out of the ground, and these work reasonably well under most soil conditions. A pair of 'squeeze' wheels are offered with some machines and these can reduce the draught of the machine. On lighter soils they can travel faster, they are less prone to block in rubbishy conditions and they disturb the soil less.

If top saving is important, then specialized machines topping two rows in advance of the lifter are worth considering, since this reduces contamination by the tractor wheels and gives more space for the 'tops' elevator.

The speed of harvesting should always be regulated to the size of crop and ground conditions—the heavier the crop the slower the forward speed. At

With this tanker harvester, the beet are topped by a unit on the far side of the machine and lifted by 'squeeze' wheels (seen under the drawbar of the tractor). They are then elevated by a chain conveyor to clean off the soil and deposited in the tank mounted over the axle of the land wheels

excessive speeds the beet can be knocked over, giving faulty topping and increased wear on moving parts. Some growers on lighter soils find they can harvest some 3–3½ acres (or 50 tons) a day with a harvester and two trailers. Usually if the tops are being saved the output falls by at least one acre a day; 1½–2 acres a day is a good output from a top-saving machine.

Though acreages of 120 per machine per season are known to be covered, to allow for bad weather at the end of the season it would perhaps be more practical to allow for 80–90 acres maximum.

Because of the allocation of sugar beet acreages, many growers are unable to grow a sufficient acreage to offer a full season's work for a harvester on their own farm. Also, with loading permits it is often impossible to give a full week's work to a machine. For these reasons a beet harvester is an ideal machine for sharing on a syndicate basis between two or three farms.

It can be shown that economically the harvester is justified on a quite small acreage but it is obviously better business to have adequate use of a machine for, say, one-third of the capital rather than tie up the full capital value and have the machine working for only one-third of its potential.

A syndicate can give the smaller grower a call on a really modern new machine, and it can, of course, be replaced at regular intervals.

Probably three growers with small acreages might well form a syndicate and share a precision drill, a beet harvester and a loader cleaner at no greater cost individually than the price of a harvester.

F. L. GAMMON, DIP. AGRIC.(WYE), M.I.AG.E.

and

C. M. POOLE, A.M.I.AG.E.

21. Petersfield, Hants

John H. Hamilton

PETERSFIELD, lying close to the West Sussex county boundary, was, until twelve months ago, the market town for this district. But this market was then closed, and the area is now served by those at Guildford, Chichester and Winchester. Apart from the small towns of Alton and Petersfield, there are no industrial areas.

No natural divisions separate this district from those adjoining. Topographically, the land lies within the 200–700 ft contours, most of it around 500 ft above sea level. Butser Hill, a chalk mass 880 ft high, 2½ miles south-west of Petersfield, is the highest point.

Despite the district's proximity to London, just over fifty miles away, there are many comparatively large tracts of completely unspoiled countryside. It is surprisingly well wooded, with extensive areas of beech, ash and oak. The National Trust has secured some outstandingly beautiful stretches of this countryside, including the area around Selborne, famed for its association with Gilbert White, the great eighteenth century naturalist. The precipitous drops of Berryfield and Ashford Hangers, with their magnificent tree-lined slopes, and the panorama to the north from Stoner Hill, are unrivalled (particularly in the autumn).

Soils are remarkably varied. Clay caps with and without flints over chalk predominate over the central and western areas. Comparatively infertile sands of the Bagshot type are to be found around the military base at Bordon in the north-east. Small areas of Gault clays, notoriously difficult for arable working, appear over almost the whole district.

To the east of Alton there is an area of very fertile though tricky-working upper greensand. Southwards the rolling chalk downland extends beyond the district to the outskirts of Portsmouth and Southampton.

This last area has seen a major agricultural revolution in the past thirty years. In the early 1930s some farms on this chalk downland could not be let, even rent free; they could have been bought for as little as £12–£15 an acre and were rapidly reverting to scrub and rabbit warrens. But with the subsequent facilities of mechanization, better use of fertilizers, seeds and sprays, plus an assured market for cereals, the land was transformed.

The chalk downland is now getting barley crops. The average yield is 30 cwt to the acre, and on certain farms 2 tons an acre is not uncommon. Many fields on these farms are now growing their seventh to tenth barley crop in succession, quite profitably. Some of these farms have no livestock, and the break crop from cereals is now herbage seeds—a crop which is increasing in acreage every year. In spite of the intricacies of growing and harvesting, it is making a significant contribution to the overall output of these farms.

The upper greensand area near Alton is generally agreed as being the most fertile land in the county. Apart from the fact that this area is now almost entirely owner-occupied, the balance of the farming has barely changed over the last few decades.

It is a traditional hop garden area, associated then with the breweries, which have recently been expanded at Alton. Cereal crops of wheat and barley are alternated with potatoes, and fit in well. A recent shortage of casual labour has been responsible for the introduction of hop vining machines and, to a less extent, potato harvesters. The sugar beet acreage has dwindled markedly in the last few years; now it is virtually insignificant. This is due largely to the high costs of transport to the nearest factory—at Kidderminster. Livestock enterprises on these upper greensand farms are of comparatively minor importance; many farms have had none for some years.

The swift rise in cereal cropping, particularly barley on the chalk farms, is being repeated on the more difficult working soils of the clay caps over the chalk. In this part, too, in common with other areas of comparatively large farms, the era of the dairy herd seems to be passing. Dairy herds are now being standardized at the 50–65 or 100–120 cow level, and they are kept almost without exception on the yard-and-parlour system.

Although the Petersfield district has its proportion of small farms, the general trend is a rapid acceleration towards larger units. The last three years have seen a decline of 18 per cent in the acreage of holdings under 20 acres. On the 20–100-acre holdings there has been a drop of 11 per cent in the acreage farmed. On the other hand, the acreage farmed by farms of 500–1,000 acres has risen by 9 per cent and those on farms of over 1,000 acres have increased their farming acreage by 40 per cent. In this district 80 per cent of the land is farmed by 20 per cent of the farmers. Many of those small-scale farmers who remain are helped considerably by the volume of holiday traffic passing through this part of Hampshire on their way to the south coast. Self-service stalls and at-the-door sales of eggs, poultry, cream, fruit and vegetables are increasing and will probably continue to do so.

This short article would be incomplete without mention of the part played in the farm economy by machinery syndicates. Many small and not-so-small farmers have formed and operated very successfully syndicates of grain storing and drying plants, combine harvesters, silage-making machinery and even tractors. In fact, the hundredth syndicate in Hamsphire has recently been formed in this district and more are being planned.

F. W. HOLDER
Agricultural Land Service, London

Concreting in Cold Weather

ALTHOUGH we in Britain are not normally subjected to the arduous winters of N. Europe, Canada and the U.S.A., we are nevertheless beginning to realize that winter does bring in its train, if not long periods of snow, at least the occasional frosts and cold winds which can be equally damaging to building progress. Once a building has been roofed and enclosed, the difficulties of winter working, except for those related to hours of daylight, can be overcome fairly easily. It is in the early days of a contract, when most of the work is done in the open-air, that the real problems arise.

For some unaccountable reason most building contracts seem to start at the end of the summer; by the time winter sets in, building operations are well into the 'muck and muddle' stage. At this time, the most pressing problem is to lift the building off the ground into the dry as quickly as possible—a task that invariably involves making and placing concrete in foundations and floor slabs. Since weather retards the setting and hardening of concrete, the material takes longer to gain strength. If speed in setting or hardening is required, the concrete must be kept warm. If the water in the concrete is allowed to freeze before it can be dried out, the ice so formed will break up the concrete. Even if the concrete doesn't actually disintegrate, the setting process will be arrested until it has thawed.

Several types of cement are manufactured specially to alleviate such conditions. 'Rapid-Hardening' cement, as its name implies, will reduce the period during which the concrete will be susceptible to frost damage and also enable formwork to be removed earlier than if ordinary Portland cement were used. Another type of cement known as 'High-Alumina' not only hastens the setting of the concrete but also, by giving off heat, helps to keep it warm. In addition to these particular types of cement, calcium chloride, or a number of proprietary chemicals using it as a base, can be added to a concrete mix to accelerate setting and hardening. But calcium chloride should not be mixed with 'High Alumina' cement.

During hot, dry weather the setting of concrete should be retarded by covering it with sacking and keeping it wet until it sets naturally. In winter weather protection is also necessary—but from cold and wind. Protection

should take the form of an 'insulating' layer of straw or similar material about 6 inches thick, covered with tarpaulins or sacking. This will keep the straw dry and prevent it from blowing away. The object of the insulating layer is not, as might be imagined, to keep the concrete warm, but to prevent it from cooling too quickly. Where shuttering has to be used (for example, with reinforced concrete) it should be remembered that timber gives better insulation than steel, especially if backed with a good layer of straw.

When work is stopped for meal-times or at the end of the day, all newly-laid concrete should be covered, and if the site is exposed to strong winds a suitable screen should be placed around the area. The materials for making the concrete (sand, ballast and cement) should be stored under cover, preferably inside a building or shed, but if this is not possible, tarpaulins should be used. The mixing machine and barrows should be similarly protected, and they and any steel reinforcement should be thoroughly defrosted if necessary before use with hot water or steam.

New concrete should not be uncovered until it has set properly, and it is a wise precaution to keep this protection as long as possible, especially during cold weather. This applies particularly to reinforced concrete, where formwork should not be struck until absolutely necessary.

Most specifications require that concrete should not be mixed or placed until the air temperature has reached 34°F and is continuing to rise. If a fall in temperature is indicated, concreting should be stopped at once. It is not always possible, however, to conform to these rules, and so steps must be taken in such cases to minimize the risks which are likely to arise.

To avoid a stoppage, or when labour cannot usefully be employed elsewhere, it may become necessary to do concreting when temperatures are near or below freezing point. Then all sand, ballast and shuttering, should be heated before use, and the water required for the mixing should be brought to a temperature of between 120°F and 150°F before adding it to the other elements. On no account, however, should the cement be heated. A convenient method of warming the sand and ballast is to spread it on a sheet of corrugated steel supported above a coke brazier. It is hardly necessary to mention that the constant use of a thermometer for temperature reading is an essential item in winter working.

In ideal conditions, of course, the laying of floor slabs and other concrete areas would be done under cover—that is to say, after the walls are up and the roof on. This is not always practicable where access is difficult or where the factors relating to site conditions or the position of existing buildings conspire to defeat this intention. In these days, when the framed building is in almost universal use, it is often possible to erect and roof the frame and to shroud the working area either with the permanent cladding or with temporary sheeting of polythene or other suitable material. By these methods with, perhaps, the addition of localized heating (one coke brazier will keep 400 sq. feet of concrete warm), progress may often be maintained with the least risk of damage to the concrete.

These precautions may seem to be finicky and unnecessarily elaborate, but the winter of 1963 showed us only too clearly in many instances what disorganization can arise and valuable building time be lost for want of a little foresight and some elementary precautions.

IN BRIEF

Swine Fever — the Second Stage

The eradication of swine fever from this country is entering a new phase. Until March, 1963, when the new campaign started, swine fever had been endemic in Great Britain for over a hundred years, and the first need was to reduce substantially the amount of infection to which our pigs were exposed. This first objective has been reached.

The second, and in many ways more difficult, stage is now beginning. Instead of being confronted with a mass of widespread active disease, the Ministry's veterinary services will have to aim at detecting and eliminating sources of infection *before* they produce disease. The swine fever virus can be incubating in a pig undetectably for up to 28 days, and during part of this time the animal will be infective so that all other pigs with which it comes into contact are placed at risk, as are others with which they themselves come into contact. When eventually the disease shows itself in one of the pigs involved the slaughter of that animal and the immediate contacts will be of little value towards eradication unless all the other pigs which are possible links in the chain of infection can be traced and rendered harmless by isolation or by slaughter, as circumstances necessitate.

The use of crystal violet vaccine can sometimes mask the symptoms of swine fever, thus making it difficult to recognize that an animal or a herd is affected, and it was because of the need to bring the disease into the open, that supplies of vaccine were discontinued last August. Another feature of the new phase will be the prompt use of area movement restrictions to prevent spread of the disease by pigs which are known to have had the opportunity of contracting it but which have not yet been individually traced and isolated: this situation can arise, for example, when disease is confirmed in pigs which have recently passed through a market. Fortunately area restrictions imposed in these circumstances often may only need to be of short duration.

During this second stage of the eradication campaign it is more important than ever that everyone associated with pig production should give extra thought and care to such things as movement records, the proper preparation of swill, hygiene, disease security arrangements, and the prompt reporting of symptoms suggestive of swine fever. The more mistakes that are made, whether by simple thoughtlessness or downright negligence, the longer it will be before swine fever is eradicated.

PIDA's Litter Recording

PIDA's latest Litter Recording report, covering the period April, 1962–March, 1963—makes interesting reading. Mr. James White, PIDA's chief livestock officer, said that results were based on the performance of the 1,700 herds recorded under Part I of PIDA's litter recording scheme, which is mainly for pedigree producers. 'But the tips to be picked up from these results', he said, 'are of use to all pig producers. We have tried to summarize these in a series of conclusions to the various tables.'

The report says that the average number of pigs reared per sow per year is the most important single factor in the profitability of a breeding herd. The minimum aim should be 18 pigs per sow, per year. An average of two litters each of nine pigs per sow is a reasonable target.

The various factors which can help to gain this target are discussed. For instance, the average number of litters per year is 1·9, and only 30 per cent of herds average two or more litters per sow, per year. CONCLUSION: Earlier weaning, at five or six weeks, would help more herds to achieve this target.

Another table shows that 70 per cent of the herds attain an average of 10 pigs born per litter and nearly 20 per cent have twelve or more. But the report also says that most herds are still losing about two pigs per litter. CONCLUSION: This loss of two pigs can be cut by improved farrowing arrangements and management. With an average of 10 pigs per litter, not more than one lost, and two litters per year, we can, says the report, reach the target of 18 pigs per sow per year.

Weaning to Slaughter

The report also shows that heavy weaners offer a saving in feed costs and time to slaughter, and they have a greater chance of grading well. Nearly 80 per cent of weaners weighing 46 lb and over gained a premium. Commenting that pork producers get less information about their pigs than bacon producers, the report shows that many pork pigs of all weights average well over 160 days to slaughter. 'This is uneconomic'. CONCLUSION ON PORK PIGS: 'A reasonable aim for a producer of liveweight pork is a quality pig weighing 100 lb dead weight in 120 days or less, with a food conversion ratio of under 3·25. Less than 10 per cent of producers are reaching this standard, yet it is only a modest target.'

A table about the average slaughter age of heavy hogs concludes: 'A third of the herds reached heavy weight in under 200 days; but over half took more than 210 days.'

Copies of this report are available free from PIDA, Ridgmount St., London, W.C.1.

Milk Quality under Report

The Joint Milk Quality Committee, composed chiefly of representatives of the Milk Marketing Board and the Buyers of Milk, has issued its first annual progress report on milk quality. Previous annual reports were made by its predecessor, the Joint Milk Quality Control Committee.

Compositional Quality

The report contains an analysis for the year October, 1962, to September, 1963, of the number of supplies in each category of the present compositional quality scheme and an estimated percentage of gallons in these categories. It also explains the new multiband compositional quality scheme which came into operation on 1st October, and there is a table which shows the solids-not-fats and butterfat averages of a representative sample of herd milk in every year from October, 1957, to September, 1963.

Hygienic Quality

The report explains the dairy industry's hygienic quality scheme. The scheme has been operating on a trial basis since October, 1962, but from 1st October this year

there will be price reductions for milk of poor hygienic quality sold to the Milk Marketing Board.

These schemes are of the greatest interest to every farmer who sells any of his milk wholesale. Copies of the report can be obtained free from Quality Milk Department, Milk Marketing Board, Thames Ditton, Surrey.

Putting up the Egg Yield

The essence of good management of small poultry flocks is fitting the production pattern to the available resources on the particular farm. The greatest potential in the majority of so-called 'marginal flocks' lies in increasing egg yield per bird. First-class performances can be obtained without expensive or elaborate houses and equipment. The bird's basic requirements—fresh air, water, food, light and comfort—rarely require heavy investment. On the other hand, it is unwise to economize on those small investments which reduce the risk of mishaps due to forgetfulness, e.g., time switches to control electric lighting, etc., and at least two automatic drinkers in any house with more than a hundred layers. The housing of many small flocks calls for a higher degree of stockmanship, ingenuity and vigilance than is the case with, for instance, battery cages, and it is unwise to skimp on labour at the risk of lowering bird performance.

Next, food waste. Badly designed tube feeders have been found to waste food worth 4*s*. per bird per year, and many troughs in use must waste even more than this. Feeders of better design, such as that recommended by the National Institute of Poultry Husbandry, are easily made and would often recoup their cost in the first year of use. But egg yield is paramount, so that attempts to restrict food waste should not be carried to the extreme where they also restrict consumption—and hence egg production.

W. S. Senior
Nottingham University

Quote

What kind of pig do we want to meet the demands of the producer, the processor, the retailer and the housewife? This question is posed by Mr. Stephen Horvat in an article in the September issue of *Pig Farming*. 'We are told', he says, 'that among the benefits of cross-breeding are higher fertility, better growth rate and so-called "hybrid vigour". But nobody has, so far as I know, measured hybrid vigour or produced any reliable data.

'The only way to do so would be to get as much data as possible for two pure-bred herds of different breeds, where a high level of standardization has been maintained for several years, and then cross the two breeds so as to compare the production and carcass figures of the hybrids with the results of the pure-breds.

'To get an honest answer, the pure-breds and the cross-breds should be under the same management, fed on the same food, with the same housing and health standards.

'A cocktail is only as good as its ingredients, so the cross-bred pig can only be as good as the two or three pure-breds in its make-up. As far as carcass quality is concerned, the two parent breeds would have to be very similar in carcass excellence otherwise the splitting-up process in the hybrid will be very marked and the result will be "liquorice all-sorts"—highly undesirable when we consider the demands of the trade for standardization.'

Books

His Majesty's Spanish Flock. Sir Joseph Banks and the Merinos of George III of England. H. B. CARTER. Angus and Robertson. 90*s*.

Most books on the history of British livestock husbandry, make only a passing reference to the Merinos of George III. This is not surprising, for their duration was a fleeting one and neither did they play much, if any, part in the developments of our native breeds.

But to an Australian-born wool scientist, like Mr. Carter, the episode was highly significant, as it provided some of the original Merino stock from which has sprung the vast wool trade of that continent. The period concerned was a short one —1788 to 1813—but the author has produced a most detailed and thorough piece of research which will rank high for a very long time.

The leading figures in the venture were George III and his scientific adviser Sir Joseph Banks. The Royal flock at Windsor, Kew and Richmond was established in 1788 from a nucleus of 5 rams and 39 ewes. It expanded, partly by natural increase, and partly by further importations to a total of 2,781 sheep in 1813, when it was sold. During this period, small numbers of the Royal flock were distributed over the country, either by gift, private treaty, or from periodic auctions. The interest shown by George III also encouraged several landowners to arrange private importations from Spain. The breed, therefore, had representation in many parts of the British Isles, including Ireland by 1813.

The custodian of the Royal flock was Sir Joseph Banks, a Lincolnshire landowner, who was also President of the Royal Society for some forty years. His role, says Mr. Carter, was much more significant than just managing these few sheep. Wool was a commodity of internal and international trade; its manufacture was moving from the cottage to the factory, and it had considerable social and political implications to people in Britain and abroad. No single man did more to probe the intricate question of how to supply the British wool manufacturers with the raw material on which their growth would depend. In his day he was an intelligence centre and source of reference on all matters pertaining to sheep and British wool supplies.

Banks therefore emerges as a man whose contribution was largely in the industrial field of this country's history, rather than the agricultural. But, as seen through Australian eyes, his worth and influence to the pastoral industry of the southern hemisphere was enormous.

H.E.

Genetical Principles and Plant Breeding. WATKIN WILLIAMS. Blackwell Scientific Publications, Oxford. 70*s*.

The author, who is now Professor of Plant Science at the University of Newcastle upon Tyne, writes with the authority of experience in plant breeding and genetics obtained at the Welsh Plant Breeding Station and John Innes Institute. He is, therefore, in a strong position to produce a book of value for biological and agricultural students. His objective has been to expound the genetical principles known to govern the lives of plants, and in so doing to indicate the relevant knowledge and basic principles of plant breeding and crop improvement. He does not, however, deal specifically with standard plant breeding methods, but includes a final chapter on special techniques in breeding and genetics.

Modern references of this kind for university and college students must assume elementary knowledge in genetics and cytology; and this book is certainly not for the uninitiated. The author aims at linking genetics to the basic biological concepts of evolution, reproduction, development and adaptation—a difficult objective which will make considerable demands on students not reasonably well versed in these fields of science and whose genetic knowledge is scanty.

There are twelve chapters, the titles of which show clearly the scope of the book and the manner in which the author musters his material and develops his ideas—The Genetic System: The Organisation of the Genetic Material: The Chromosomal Complement: Mutation:

The Cytoplasm and Inheritance: Incompatibility Systems in Higher Plants: Mechanisms of Sex Determination: Significance of Breeding Systems: Adaptation and Discontinuity—the Nature of Populations: Selection: The Genetic Basis of Disease Resistance in Plants: Special Techniques in Plant Breeding and Genetics. The subjects are well chosen and are handled clearly and in an interesting manner.

The author has succeeded in bringing together genetical and biological concepts referred to in the preface. Plant breeding and cultivated plants are represented by many of the references to genetic work and also by special sections in the chapters such as those on incompatibility and adaptation. The detailed treatment of disease resistance is interesting and valuable while the final chapter deals largely with chromosomal manipulation as a breeding technique. This is very topical and in spite of some textual errors, there is no doubt this book is useful. It is well produced and has good illustrations.

G.D.H.B.

Irrigation. Its Profitable Use for Agricultural and Horticultural Crops. SYLVIA LAVERTON. Oxford University Press. 21*s*.

The publication of this book is a milestone in the development of irrigation in this country; the comprehensive nature of its contents indicates the large amount of information now available on this subject. From the text it will be apparent that irrigation is likely to remain a permanent feature of British agriculture, as it gives an informed account of the potentials and possibilities of this new technique.

It is no mean task to satisfactorily bring together information from a wide variety of sources into a readable comprehensive account. To attempt this for a subject such as irrigation is even more difficult, remembering that the disciplines involved include meteorology, biology, engineering, soil science and economics.

Mrs. Laverton has, to a large extent, been successful, having wisely based the text on a few fairly comprehensive publications. Only a small number of inaccuracies and outdated recommendations are included but the more interested reader will be perplexed from time to time by a number of inconsistencies. These occur where information on a particular aspect has been drawn from a number of sources and then appears in different sections of the book. The book has little to offer to the more serious student of irrigation, since the major sources of information will already be familiar; it can, however, be thoroughly recommended to the general reader as a clear, up-to-date synthesis of irrigation knowledge.

On the whole the account is well-balanced, but the chapter on equipment is surprisingly short and disappointing in its content. The sections on costs, as might be expected from the title, are extensive but do little other than to emphasize the variabilities which are likely to occur in practice. This lengthy account would have been more than justified if some of the information emerging from the surveys had been used to show a would-be irrigator how to plan and operate the most economic system.

J.J.N.

The Australian Wool Industry. H. MUNZ. Angus and Robertson. 50*s*.

There are in Australia now about 160 million sheep—mainly merino, merino crosses or 'come-backs' to merino. The gross annual value of the wool clip is estimated at £398 million and exports at £358 million. If to this is added the annual return from lamb, mutton and skins, it becomes difficult to find an expression to take the place of that well-burnished cliché —the Australian economy rides on the back of a sheep with a golden fleece.

Yet less than two hundred years ago there were no sheep in Australia; there was not even a permanent European settlement.

One of the first of many problems facing the early, permanent settlers was to produce for export a raw material which needed little labour, would stand the slow, 12,000 mile voyage to England, which would be in constant demand, bear the cost of transport and be saleable at a profit: the arrogant but astute Macarthur and the commercial ecclesiastic Marsden found the answer in wool, and so it is still.

This book gives a general survey of the epic growth and development of the Australian wool industry; and it does so cogently, concisely and clearly.

The main author is well qualified for the task; he has been a jackeroo on a sheep

station, wool classer and wool scientist; he is now a trader in wool; his collaborators are authorities in their specialist fields.

Some may say that a book of 238 pages cannot possibly deal comprehensively with such a large, many-sided and evolving subject; the author agrees. Nevertheless it offers much in a small space to the wool grower, the wool scientist, the wool trader, the manufacturer and the general reader, both in Australia and elsewhere.

In Britain wool might be described as a by-product of mutton and lamb; in Australia the opposite is almost true. The book has much to teach us in this country on the genetics of wool production and possibly more on wool handling and classing on the farm, although we must always remember that in this respect the Australians have the big battalions and the benefits of big enterprise.

The Australian wool industry is haunted yet inspired by the spectre of man-made fibres. At present, controversy rages over wool marketing; it wonders whether the auction system without modification is best or whether there might be something in a marketing scheme with a floor to it; the growers do not speak with one organized voice. Would it be bad for the Australian wool industry to lift the ban on exporting merino breeding stock and the ban on importing breeding sheep from Britain?

The Australian Wool Board, with more power recently added to its elbow and ably led by Sir William Gunn, is in the midst of yet another agony of reappraisal. The Australian wool scientists and their colleagues, whether in C.S.I.R.O., the universities or State Departments of Agriculture, are as productive as ever. May be all these things will persuade Hirch Munz to write 'the other volume' and a contemporary, a counterpoise—'The relative value of wool and secondary industry to the economy of Australia'; for, after all, Australia is a highly industrialized country.

J.K.

Environmental Biology, Volume I. R. F. MORGAN. The Commonwealth and International Library of Science, Technology, Engineering and Liberal Studies. Pergamon Press. 12*s.* 6*d.*

The need for better understanding by the layman of complex biological relationships, which he may now unwittingly disturb or disrupt, has been emphasized in recent discussion of the long-term effects of herbicides and insecticides. Improvement of biological teaching is at present under consideration by the Biological Education Committee set up by the Royal Society and the Institute of Biology, so this volume is topical. It is the first of a series intended to provide text-books in field biology both for students taking G.C.E. at 'O' level in Biology, Rural Biology and Agricultural Science, and for those seeking a wider understanding of biology in everyday affairs.

The author points out that studies of individual plants and animals should be linked with environmental factors to show the inter-relationships and unity of life. Attention has therefore been focussed mainly on the adaptation of specific organisms to their habitats; more detailed studies are to follow in later volumes. It is difficult, however, for the relevance of different environmental factors to be appreciated without some knowledge of their effect on the physiological processes of the organism. In particular, the effect of light on the leaves of a plant should be related to the requirements for photosynthesis, and the role of chemicals in the environment to the nutrition, respiration, and growth of the various organisms.

The book describes twenty-four assignments for the experimental investigation of the relationship between the plants, insects and animals in a ¼-acre school garden, and the environment represented by the soil, climate and atmosphere. Detailed instructions are given for setting up each experiment and for making observations, from which the reader is told to draw his own conclusions. As the text gives little indication of the appropriate conclusions, it is evident that a qualified biologist should be available for discussion. This will limit the value of the 'do-it-yourself' approach to experimental technique, which might otherwise have enabled the reader to acquire for himself a grounding in scientific method and a biological interest in his garden.

P.S.W.

A Bibliography of Farm Buildings Research. Part VII—Miscellaneous Items, 1st Supplement, 1958-1961. Agricultural Research Council. 2*s.* 6*d.* (by post 3*s.*)

The more obvious categories of farm buildings such as dairies get a good deal of prominence, both in writing and our thoughts. But what of the other odds and ends which go to make up our homesteads and which in their own way are no less important?

The A.R.C. publications on the main groups are well known, though they deserve to be better known and certainly more widely studied. They can remove a good deal of ignorance and properly used should save money too.

This latest addition ranges over a wide field of 'remnants' and is just as exciting in its way as any bargain basement!

Housing sheep, we are told, is neither cheaper nor dearer than outwintering, and no harm comes to their breeding qualities. However, housed sheep which ran out during the day suffered least setbacks when turned out in the spring. In a mild winter sheep housed in heated pens did no better than those outdoors, but in a severe winter they did better—to be expected, no doubt, but we do need proof like this.

A new kind of structure is reported on 'bubble buildings'. Nothing to do with detergents but a report on two American studies of pneumatic plastic buildings as temporary stores. It seems a plastic membrane is inflated and kept so by fan-maintained internal air pressure. Recommended as temporary stores or even cattle shelters, but what an awful temptation for a small boy with a big knife!

On the booklet goes through the planning of farm buildings, tests of materials, economic studies and materials handling; and what a colossal weight and volume our farmers move every day, often more than once, too!

And then to the last item of all: trials of solar water heaters in Australia. An intriguing item this, but we need shed no tears for a shortage of sunshine. The investigation showed water heating in this way cost just as much as heating by electricity. So we can go on with our sunless summers and our off-peak cheap electricity.

A worthwhile publication, cheap at three shillings.

C.R.

Farm Organisation and Incomes in South-West England 1962-63. S. T. Morris, H. W. B. Luxton and G. D. D. Davies. University of Exeter. 5*s*.

In the first section of this annual report on the Farm Management Survey of the South-West, the sample and the physical details of the farms are described, and the important point is made that this sample is not representative of the farms in this area as it contains proportionately more large farms.

An interesting summary is given of the results of an identical sample of 148 farms from 1953 to 1962. Net farm income in 1962 was, on average, 31 per cent higher than in 1953, but the progression was not a steady upward one. Two bad years, 1954 and 1955, were followed by three years of rising incomes, but in 1958 the drought, and consequent reliance on purchased feeds, caused incomes to drop away. Since then they have increased steadily.

Gross output and costs on these farms have risen continuously over the period but at different rates, the level of costs rising more quickly. It is suggested, that in this region the tendency has been to push up output to maintain incomes rather than to reduce costs, and farmers are exhorted to check their use of purchased concentrates.

In 1962–63, 59 per cent of the farms improved on their 1961–62 incomes, the increases ranging from £25 to £1,185 per farm. On the basis of size of farms, only the 50–100 acre farms did not share the increased prosperity. A notable feature was the above-average increase in the incomes of farms of over 200 acres; their performance was less happy when reported last time. Intensification of output on these farms was at a rate at least comparable to that on the smaller ones, while opportunities for cost-saving are greater.

The alternative presentation of the results by type and by size of farm, leads to a seeming inconsistency in the section 'Returns to Management'. Thus, on the one hand 'returns to management were adequate in all type-groups' (with one exception), while on the other 'when related to size of farm . . . on farms below 100 acres the reward to management is extremely small . . .'. What the actual figure probably showed was that reward to management was good on the bigger farms in each type-group. For reasons of sample size it has not been possible to give results by type and size of farm in two-way tables. One wonders whether a reduction in the number of size-groups would not make this possible. If not, a plea could be made to give the range about the separate average figures by type and by size of farm.

W.J.K.T.

Manuring of Fruit Crops is the subject of the latest booklet from Potash Ltd. It covers top fruit, bush fruit and soft fruit and is presented with admirable clarity. Free from Norfolk House, St. James's Square, London S.W.1.

BOOKS RECEIVED

Institute of Animal Physiology, Babraham, Cambridge. Report for 1962-63.

Agricultural Research Council. 7*s.* 6*d.*

•

Guide to the Department of Agriculture and to the College Farm 1964.

Wye College.

Long Ashton Agricultural and Horticultural Research Station Annual Report 1963.

University of Bristol. 15*s.*

•

Department of Hop Research Annual Report 1963.

Wye College. 6*s.*

Agricultural Chemicals Approval Scheme

Since the publication of the 1964 List, the following additional product has been approved:

HERBICIDES

DIMEXAN

A contact herbicide for the control of weed seedlings for use pre-emergence in drilled crops, e.g., sugar beet, beans, carrots, etc., and also in potatoes and bulbs.

Liquid Formulations

Tri-P.E.—F. Bos Ltd.

ACKNOWLEDGMENT OF PHOTOGRAPHS

We gratefully acknowledge permission to use the following photographs:

P. 449 W. Dyfri Jones. Pp. 450 and 451 *Poultry World.* P. 463 *Farmer and Stockbreeder.* Pp. 471 and 472 Layland-Ross. P. 480 F. A. Standen and Co. Ltd.

AGRICULTURE

Price 1s. net monthly (by post 1s. 5d.).

Subscription Rates (including postage):

Home and Commonwealth: 14s. per annum. Foreign Countries 15s. per annum

Subscriptions may start with any issue and should be sent to:

HER MAJESTY'S STATIONERY OFFICE

York House, Kingsway, London W.C.2
13a Castle Street, Edinburgh 2
39 King Street, Manchester 2
35 Smallbrook, Ringway, Birmingham 5
423 Oxford Street, London W.1
109 St. Mary Street, Cardiff
1 Tower Lane, Bristol 1
80 Chichester Street, Belfast

Single copies can be purchased from any of the above-mentioned addresses or through a bookseller, price 1s.

Printed in England for Her Majesty's Stationery Office
by Hull Printers Limited, Willerby, Hull, Yorks.

(K121) 72-1-64-10

PORTRAIT OF A SILCOCK CONVERT

Mr. W. Walker, Berrill Farm, East Hardwick, Pontefract, Yorks., changed to Silcocks because his Friesians were averaging only 3.26% butterfat. He steamed-up according to the Silcock recommendations and not only improved the butterfat to 3.45% but also raised the milk yield by as much as 106 gallons per cow to an average of 1,365 gallons. Moreover, food costs fell by a halfpenny per gallon, bringing in an extra 56/- per cow.

Planned steaming-up is the fundamental basis of all really successful milk production. It helps to increase yields, or improve compositional quality, or lower the costs, or increase profits, or — as in the case of Mr. Walker's herd — all four of these things. A Silcock Advisory Service booklet on the subject is available free of charge.

R. Silcock & Sons Ltd, Stanley Hall, Liverpool 3

SILCOCKS

Stamp out couch !

with

WEEDAZOL

* For full details and names of main distributors apply to the manufacturers:-

A. H. MARKS & CO. LTD.
WYKE, BRADFORD
Phone: Bradford 78372/3

Marks

It pays to prevent

LIVER FLUKE

by killing the

SNAIL HOST

with

MacKECHNIE BRAND

COPPER SULPHATE

For further information write:

McKechnie Bros. Ltd.,
P.O. Box. No. 4,
Ditton Road, Widnes, Lancs.

Ministry of Agriculture, Fisheries and Food

Selected Bulletins

Salad and other food crops in Glasshouses

Salads are increasing in popularity and the grower who produces these crops is sure of a steady market throughout the year. This extensively revised and well illustrated bulletin gives up-to-date information, on most crops which are grown commercially under glass, which will be of value to the commercial grower and the amateur gardener. Crops are dealt with individually and there is a section on pests and diseases and their control.

(Bulletin No. 143) 5s. (5s. 5d.)

Fruit Tree Raising

Deals with all aspects of fruit tree raising, and contains invaluable chapters on pest and disease control in the nursery and on virus diseases. Advice is given about the types of rootstock available and their chief characteristics and suitability for each kind of fruit. The new edition of this handbook is well illustrated with photographs and diagrams and will be indispensable to the commercial fruit grower.

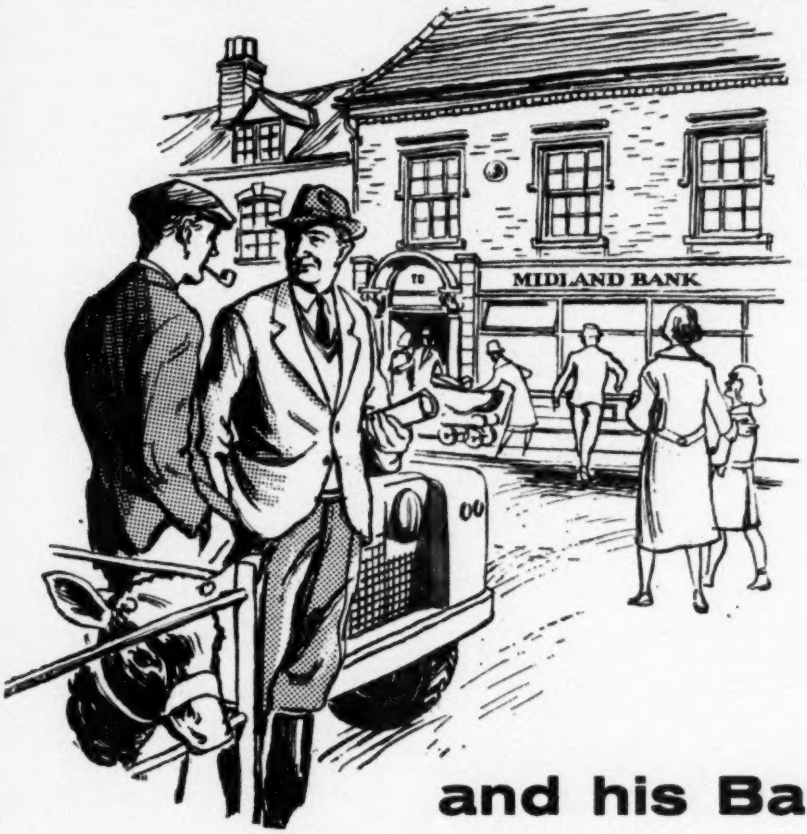
(Bulletin No. 135) 7s. (7s. 6d.)

Prices in brackets include postage.

HMSO

Government publications and those of the Food and Agriculture Organisation can be purchased from the Government Bookshops in London, Edinburgh, Manchester, Birmingham, Cardiff, Bristol and Belfast, or through any bookseller.

THE FARMER–



and his Bank

From the earliest days of banking, the association between the farmer and the bank of his choice has been one of close and friendly understanding. This is particularly true when the farmer's choice is the Midland Bank, for he knows that expert advice and assistance are always available. Equally, by its long experience and knowledge of the farmer's needs, the Midland is often able to solve a problem which through other eyes may well appear insoluble. Help of this kind can be provided at more than 2,500 branches throughout England and Wales.

Midland Bank

HEAD OFFICE, POULTRY, LONDON, E.C.2.

BOOKS

on

AGRICULTURE
HORTICULTURE
ANIMAL HUSBANDRY
and
VETERINARY SCIENCE

Catalogues sent on request

★

Lewis's Scientific Lending Library

ANNUAL SUBSCRIPTION (Town or Country) from £2 5s. 0d.

Prospectus sent on request

The Library includes all recent and Standard Works on Agriculture, Botany and Allied Subjects

★

H. K. LEWIS & Co. Ltd.
136 GOWER STREET, LONDON, W.C.1
Telephone: EUSton 4282

OFFICIAL APPOINTMENT

LINCOLN COLLEGE
New Zealand

CHAIR IN FARM MANAGEMENT

Applications are invited for appointment to the position of Professor of Farm Management. Applicants should hold a University degree in Agriculture or Agricultural Economics or in Arts or Commerce with experience in Agriculture. Preference will be given to candidates whose major field is in Farm Management and Production Economics.

Salary £3,250 per annum. Superannuation available and certain expenses of appointment paid.

Conditions of appointment are obtainable from the Secretary, Association of Commonwealth Universities (Branch Office), Marlborough House, Pall Mall, London, S.W.1.

Applications close in New Zealand and London on **14th November, 1964.**

OFFICIAL APPOINTMENT

GOVERNMENT OF NORTHERN IRELAND

HEAD OF AGRICULTURAL ENGINEERING DEPARTMENT (MALE)

Applications are invited for the above pensionable post in a new Agricultural Engineering Department at Loughry Agricultural College, Ministry of Agriculture, Cookstown, Co. Tyrone. The College provides three-year Diploma Courses in Dairying and Poultry Husbandry and a one-year Certificate course in Poultry, Dairying and general Agriculture. Qualifications: University degree and post-graduate qualifications in subjects pertaining to Agriculture or Agricultural Engineering. Candidate appointed will be responsible under direction of the Principal for the operation of the Agricultural Engineering Department. The functions of this Department will include—

(*a*) Teaching of Building Construction, Physics and Dairy Engineering to Diploma level and Building Construction and Farm Machinery to Certificate level.

(*b*) Experimental work particularly in Farm Buildings design, stock housing and environmental control.

(*c*) Care and maintenance of College equipment and machinery.

Salary Scale: £1,876–£2,318. Starting salary will depend on qualifications and experience. Preference for ex-Service candidates. Application forms obtainable from Civil Service Commission, Stormont, Belfast, 4, must be returned together with copies of two recent testimonials by 30th October, 1964.

MINISTRY OF AGRICULTURE,
FISHERIES AND FOOD

Experimental Husbandry

Gives accounts of husbandry experiments carried out at both experimental husbandry and commercial farms throughout the country. It should have a wide appeal for farmers, their advisers, research workers and students.

Experimental Horticulture

Designed for commercial growers of fruit, flowers, vegetables and crops under glass, this publication contains accounts of experimental work and its bearing on practical problems in the field.

These publications are issued at irregular intervals (two or three times a year). Prices range from 3*s. to* 7*s.* 6*d. (postage extra).*

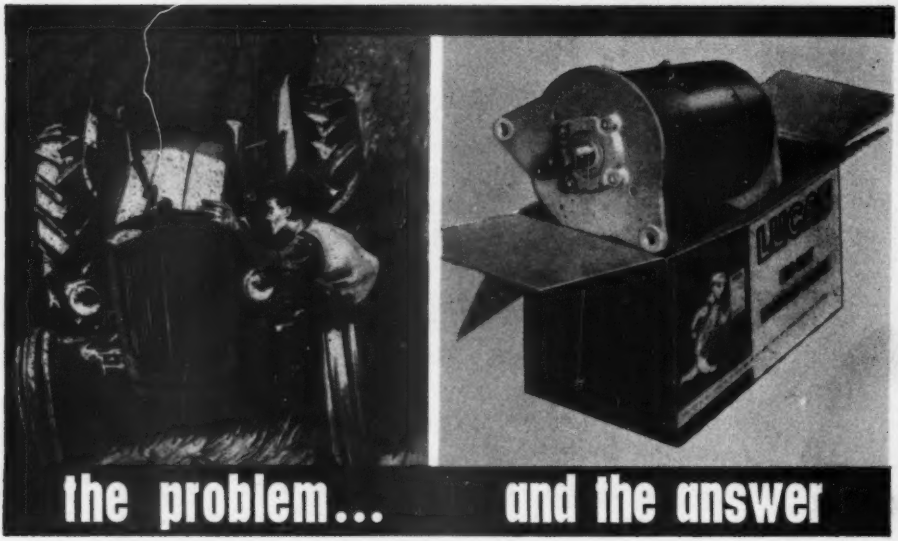
Plant Pathology

A quarterly publication presenting original contributions on plant diseases, plant pests, rodent and bird damage, nutritional and physiological disorders of interest to the mycologist, entomologist, helminthologist, soil or nutrition chemist, plant physiologist and meteorologist.

Single copies 7*s.* 6*d. (by post* 7*s.* 11*d.)*
Yearly subscription 31*s.* 4*d. (including postage)*

Government publications can be purchased over the counter or by post from the Government Bookshops in London, Edinburgh, Manchester, Birmingham, Cardiff, Bristol and Belfast, or through any bookseller

ELECTRICAL BREAKDOWN
after years of service



Electrical breakdown, after years of tractor service, is a problem easily answered. Not by repair, which takes valuable time, but by the Lucas B90 Unit Exchange Service. B90 Units are starters, generators, magnetos, etc., reconditioned by Lucas and Guaranteed for 12 months. Available off-the-shelf, they can be fitted on the spot—in a fraction of repair time.

LUCAS

B90 UNIT EXCHANGE SERVICE

OBTAINABLE FROM YOUR LOCAL AGRICULTURAL ENGINEER

JOSEPH LUCAS LTD . BIRMINGHAM 19